

NATURE MAGAZINE

VOLUME 31 • MARCH • 1938 • NUMBER 3

To the Land of the Cirio

Where a "forest" of strange plants dwells in isolation

By CHARLES SHELTON

Photographs by Hulbert Burroughs and the Author

HIDDEN away in the relatively unknown desert land of Lower California is one of the most remarkable plants of all North America. It is the cirio, unique in the plant world, a desert dweller that is not a tree, not a shrub, and which has no true limbs. It looks like the remnant of a landscape through which prehistoric animals might have roamed hundreds of thousands of years ago.

The home of the cirio is not far from the population centers of Los Angeles and San Diego. Yet only a mere handful of Americans have ever seen this forest, the only one of its kind in the world.

If you are a desert lover, or one who does not mind a bad road or two, you could easily make a round trip spin from San Diego down into the cirio-land and back again in five days. The first day's travel carries you through the interesting border towns of Tijuana, Agua Caliente and Ensenada. The second day out should find you at the little Mexican sea-coast town of El Rosario, a friendly village whose typical native tempo is still undisturbed by tourist influence, and nine miles south of there you will see



LIKE A TREE OF ANOTHER WORLD, THE GROTESQUE CIRIO CREATES AN IMPRESSION OF UNEARTHLINESS

the first cirio, the northernmost sentry of a stand of a million members that live in this arid land.

The cirio forest is like no other forest on earth. On every side great twisted trunks grow sixty or sixty-five feet high. Well might you imagine yourself in the midst of a timber-land that has been burned over until nothing is left but gaunt stems of trees. Yet the cirio, on closer examination, turns out to be quite an interesting fellow, a plant as unique as it is strange. Luckily, Nature must have taken a little pity on this peculiar desert dweller, for she added a bit of dignity to its makeup that is quite becoming, and is probably its only saving grace, for altogether the cirio is rather an unfriendly plant, being thick-hided, thorny and shadeless. Yet this air of aloofness makes it all the more interesting.

It is typical of desert dwellers, be they plant or animal, to be shy but not unfriendly; however, the cirio is not typical. It is a plant apart, acting as if it were the aristocrat of the skyline, disdaining its lesser neighbors, the bulky cardone, the cruel cholla, the ragged datillio and the tremb-

ling ocotillo. How the grotesque old cirio can maintain such a distinctly undemocratic mien is a mystery, for any hopping kangaroo-rat or passing rabbit can tell you that the old blue-blood drinks the same rain water, roots in the same soil, breathes the same air and bakes in the same sunlight, as do all the other desert inhabitants.

No two cirios are alike. The babies may be only a foot high and three inches through at the base, while the others range from the infant size to an average height of thirty feet and to extreme heights of sixty-five feet, with bases three feet thick. Some are as straight as schooners' masts; others have twisted over in a natural arch until they touch the earth with tip as well as base. Still others look like old-time hall trees, Paul Bunyan size. Most have only a single, tapering trunk; a few branch into five or six tips near the top like long fingers reaching into the cloudless blue. These latter might well be the forest priests, with their slender hands outstretched in a constant prayer for rain.

Seen from a distance, each cirio seems to be covered with a yellowish or, in rainy years, a green patina. Closer inspection reveals this to be an interwoven mass of twig-like barbs that extend six inches or so from the bark, giving the cirio perfect protection from would-be animal marauders. The mat of thorns discourages the hardest woodpecker and the hungriest cow. Small, sour-tasting leaves that put in their appearance after a rain complete the cirio's outer adornment, except for the plant's flowers. The bloom, which is coincident with the rainfall, is a delicate and fragrant white flower that stands out from the top of the trunk on stems a foot long. Within two weeks' time the stem and flower start to turn brown and soon become as sere looking as the rest of the plant. At this time the seed pods

break open and spread their contents near the foot of the cirio. Few of the seeds, however, germinate. Insects, birds and rats combine with rigorous growing conditions to take a toll of perhaps ninety-eight percent of the seeds that fall on the sand and rocks of the desert floor.

The plant's outer bark, which is tough and resistant to boring insects, covers a woody cylinder that is an inch to an inch and a half thick in the larger specimens and gives the trunk rigidity. Inside this layer is a pithy core that becomes quite turgid with stored up water whenever rain falls. Unlike many desert plants, the cirio's

outward covering does not shrink or swell with moisture fluctuations.

For two hundred miles the cirio blankets the peninsula of Lower California, from the vicinity of El Rosario on the north to Mesquite on the south. True, the desert sun and wind have worn the blanket thin in spots where only an occasional cirio appears on the hillside horizon, but even there it is the outstanding feature of the landscape.

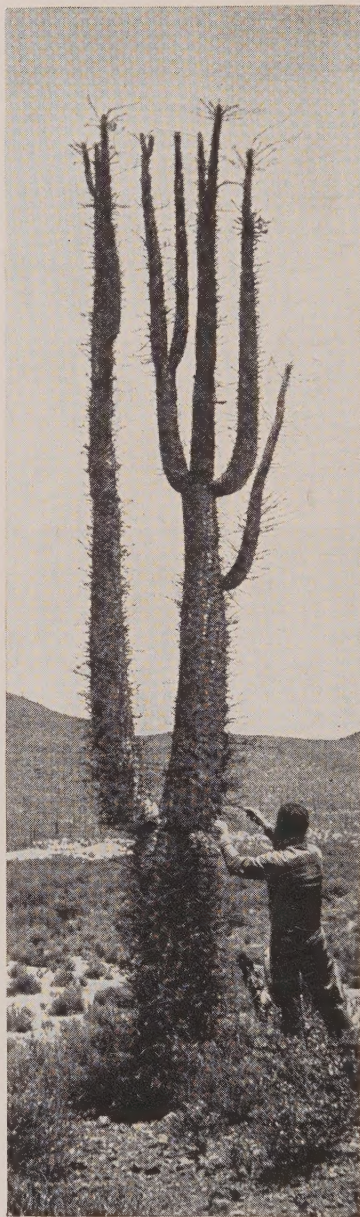
It is an interesting fact that there is only one place other than Lower California where the cirio grows naturally. Across the Gulf of California on the shores of Sonora, not far from the line of the proposed highway down the west coast of Mexico, there is a group of a few hundred flourishing specimens. But the Sonoran plants may not be natives of that region. One of the few cirio experts in the country, Mr. Glenton G. Sykes of the research staff of the Southwestern Forest and Range Experiment Station at Tucson, Arizona, states that it is possible that early Indians, crossing the gulf at this, its narrowest point, may have carried the cirio across to Sonora for transplantation. Today the Sonoran outcasts are merely another puzzling factor in the enigma of the cirio.

Scientifically the plant is classified as *Idria columnaris*, and is in the Ocotillo family, which includes the familiar ocotillo of the southwest and the palo adan tree of Mexico. Early Spanish explorers, relying more on imagination and less on science, gave the plant its common name of cirio, which is Spanish for "candle", or "wax taper".

As far as gardeners are concerned, the big desert plant is still a rare collector's item. Few gardens boast of a cirio specimen. There are perhaps a dozen in European hot-houses, half a dozen in the eastern United States,

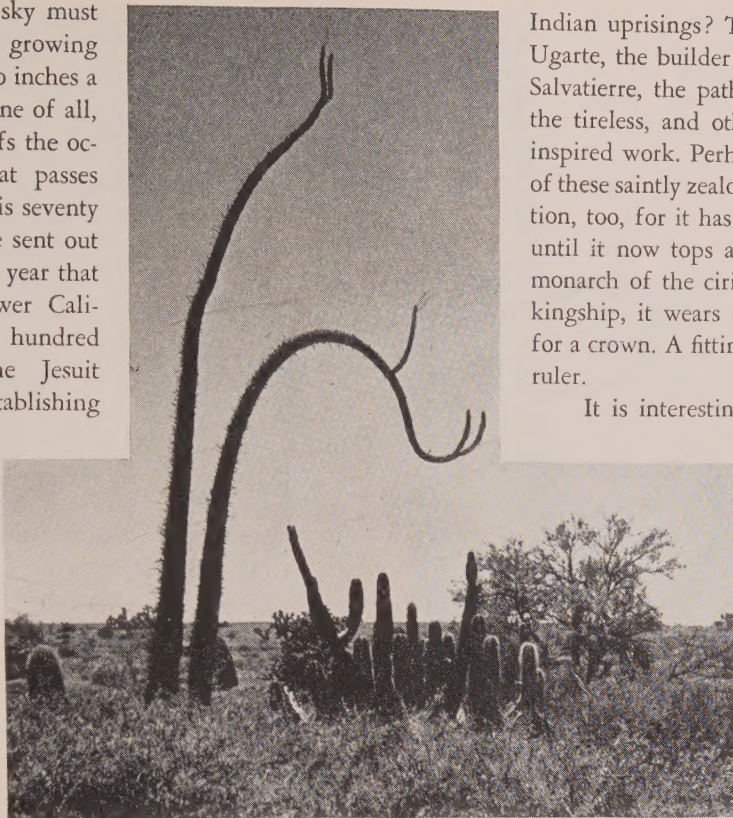
some in Chicago and St. Louis, and a score in Southern California. Mr. William Hertrich, curator of the extensive Henry E. Huntington Botanical Garden in San Marino, has nine cirios in his collection. The oldest is thirty years old and is sixteen feet high. Mr. Hertrich has found that cultivated specimens grow about six inches a year. In their natural environment, however, they average only about two inches of growth annually. The scarcity and irregularity of rainfall in the cirio region retards the plant's vegetative processes.

Some of the old giants that today tower sixty and



WHAT SEEMS, AT A DISTANCE, TO BE A FUZZY GROWTH IS REALLY A MASS OF BARBED BRANCHES

sixty-five feet into the sky must be 360 to 380 years old, growing at an average rate of two inches a year. And the highest one of all, an individual that dwarfs the occasional automobile that passes on the road beneath it, is seventy feet high and may have sent out its first rootlet the same year that Cortez set foot in Lower California in 1536. Two hundred years later, when the Jesuit missionaries were establishing their amazing chain of churches in the peninsula, this plant had grown to a height of thirty-two feet. Who knows what pioneering padres may have tied their pacing "hinnies" at the foot of this same patriarch? What stories may it have heard of desert hardships, of miracles, of



HERE IS NO DEAD AND SAGGING SKELETON OF A TREE, BUT A HEALTHY CIRIO. GROWTH IS SPASMODIC AND THERE ARE NO TRUE BRANCHES

Indian uprisings? There it stood as Father Ugarte, the builder; Consag, the Austrian; Salvatierre, the pathfinder; Junipero Serra, the tireless, and others passed by on their inspired work. Perhaps the presence of one of these saintly zealots gave this cirio inspiration, too, for it has climbed toward heaven until it now tops all its brothers. It is the monarch of the cirios, and, in token of its kingship, it wears a red-tailed hawk's nest for a crown. A fitting headpiece for a desert ruler.

It is interesting to note that the cirio forest forms a remarkable counterpart to our own sequoia forest. Each is an isolated botanical group; one three hundred miles south of the border, the other three hundred miles north. The sequoia is the noblest and oldest citizen of Alta California, the cirio the lord of Baja California.

AT FIRST GLIMPSE THE CIRIOS SUGGEST THE REMAINS OF A FIRE-GUTTED FOREST, OR NO-MAN'S LAND AFTER MONTHS OF SHELL FIRE. YET SUNSET IN CIRIO-LAND, WITH A THOUSAND "CANDLES" AGAINST A SKYLINE OF GOLD, IS SOMETHING TO REMEMBER



CLOSE VIEW OF THE WRINKLED BARK AND THE SHORT, THORNY BRANCHES, WHICH ARE MORE PROFUSE ON THE SUNNY SIDE OF THE TRUNK. THESE BEAR THE LEAVES OF THE CIRIO

Though the home of the cirio is far below the border towns of Tia Juana and Ensenada, it is well worth a visit. Two days of slow and bumpy going will take you to the top edge of the forest, with another two days carrying you to the southernmost cirio; though the roads are "poco malo", as the friendly Mexicans admit, all is forgiven when you experience your first sunset in cirio-land where a thousand delicate "candles" form a silhouetted filigree in the fading skyline of gold.



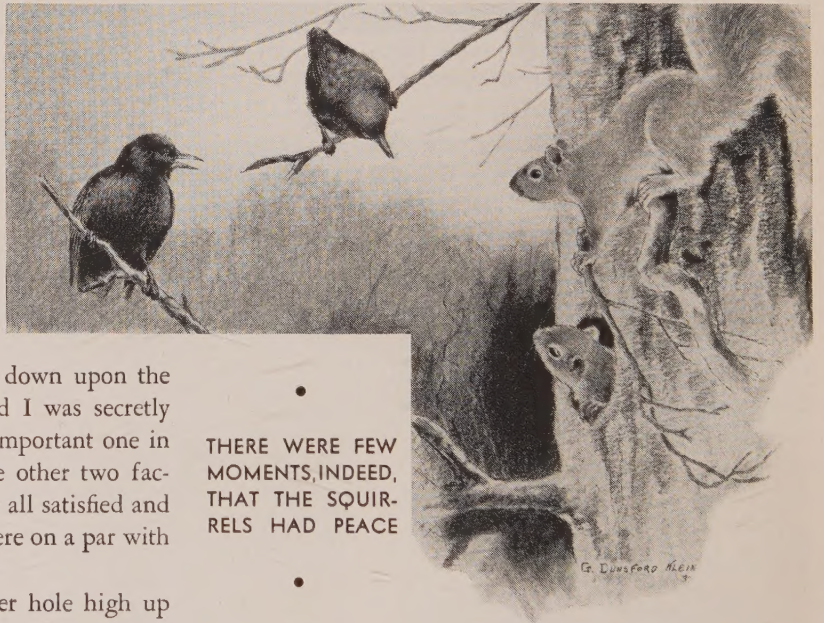
WANTED— A HOME

By G. DUNSFORD KLEIN

Illustration by the Author

AT LAST a blissful peace had settled down upon the inhabitants of my back yard, and I was secretly proud of it, for my part was an important one in the little affair. I doubt, however, if the other two factions knew I was even in it. But, we were all satisfied and I will wager that, after all, my rewards were on a par with theirs.

It all started over an abandoned flicker hole high up in a grizzled old chestnut oak. The gray squirrels took possession of it shortly after the flickers moved out, and for several years they were exceedingly happy in their secure home. There was always food awaiting them in the tray at the foot of the tree, and I made my notes, protected them as well as I could from cats, and fed and sketched them. Last spring, however, a pair of starlings decided that the oak tree was the exact place they were looking for to raise their precious young, and that they need look no further. Then began the task of driving the squirrels out, and I must say they went about it in a determined and businesslike manner. There were few moments, indeed, that the squirrels had peace, and if the hole was left alone for an instant a starling would be inside arranging it to suit herself, while the other would



THERE WERE FEW
MOMENTS, INDEED,
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RELS HAD PEACE

be perched on a limb beside the entrance making queer noises and no doubt feeling well satisfied with himself and the world.

The squirrels were fighting a losing battle, and if I were to have the pleasure of seeing them about I decided that action must be taken at once. A starling house was soon constructed and nailed in a convenient place. Eventually the starlings decided, with the aid of the squirrels, that the nest box was much nicer than the tree anyway, and moved in. The squirrels were more than pleased to get rid of the aggressive birds, and I had the pleasure of observing two pairs of Nature's children raise their young instead of one. I might add that both families did very nicely, thank you, once squatter's rights had been settled.

Galapagos Enemies

The fiery-red "Sally Lightfoot" crab must use its wits to escape the Green Heron on the island's lava shores

By WOLFGANG VON HAGEN

ON THE black basalt lava of the shores of the Galapagos Islands the crabs move in clattering red armies. To watch them during the heat of midday, when their enemies are not in evidence, one might conclude that they had not a care in the world, and that their only object in life was the staging of their fantastic "fistic" combats. Early in our stay we christened them "Sally Lightfoots", a name descriptive of their agile movements. They move in any direction with equal ease, and so rapid are their movements at times that one might be excused if he declared that they went in two directions at once.

This small, fiery-red crab, known scientifically as *Grapsus grapsus*, is the most abundant and conspicuous of the Galapagos animals. It is known nowhere else and spends its life on the beach or hiding in the numerous crevices that are found everywhere in the partly weathered lava.

It is during the midday heat that the whole army of "Sally Lightfoots" sweep across the lava beach to disport themselves in the sun. Here and there two of equal size square off like a couple of boxers. Raised upon their eight nimble legs, each dangles in front a pair of pincers that look, with some stretch of the imagination, not unlike boxing gloves. Their antics are not unlike those of boxers at their best. They wave their claws before each other, spar, feint and side-step. They skip nimbly to one side at times, then clash in earnest, breaking free again with a sudden backward dash. It is a fascinating sport to watch.



THE GALAPAGOS GREEN HERON

This bird is adept at stalking the crabs that swarm over the lava shores of the Islands and daily captures large numbers of them

These duels seldom end fatally, but the combatants do not always escape unharmed. Sometimes during the swinging of pincers one claw loosens and becomes detached. When this happens the struggle ends, and the injured crab, realizing that he is no longer a match for his antagonist, loses no time in scampering away to safety. However, his present incapacity does not preclude future engagements of a similar nature, for he will eventually grow another claw to replace the one lost and, if he escapes his enemies, will later return to the arena.

Apparently the chief enemy of the Sally Lightfoots in the Galapagos is the green heron, *Butorides plumbeus*. This bird is astonishingly adept in the stalking of crabs, and it daily destroys large numbers of them. As a defense the crab must depend solely on two things, its own nimbleness of foot and the protection afforded by the many lava crevices. The tactics of the bird and crab are a treat to observe, as it is impossible to tell which will win the grim game of life and death. To the heron, success means

"SALLY LIGHTFOOT"

Armies of these fiery-red crabs, the most abundant and conspicuous of Galapagos inhabitants, disport themselves on the lava shores during the heat of the midday sun

a meal; to the crab, escape means another lease on life.

Singling out a victim from among the hosts of crabs covering the rocks, the heron pauses a moment as though frozen, his eyes staring intently at his intended meal. He moves slowly, almost imperceptibly, forward. The crab, now equally wary, retreats so slowly that its movement is scarcely noticeable. While keeping its periscopic eyes on the heron, the crab seeks a favorable foothold on some irregularity of the rock. With some of its legs secure in the footing, it seeks with others another projection and, finding it, retreats farther. The heron crouches low and moves forward in an attempt to get within striking distance. The crab moves again. This jockeying for position

may go on for as long as thirty minutes. Now, perhaps, the crab locates a favorable spot where his legs anchor him firmly; the front legs strain against the hind ones; then they are suddenly relaxed, literally throwing the crab backward into a protecting crevice. At the same time the heron's head flashes forward. Has he missed? He raises his crest in anger and stares blankly at the crevice, then moves away to seek a less agile or less fortunate crustacean.

That the heron is often successful, however, is attested by the empty shells that are upon the beach and among the crevices. From dawn to dusk he stalks the crabs, but during midday heat he seeks a cool retreat, leaving the beach to the crabs and their interesting sparring exhibitions.

Winter Blossoms

By MILDRED H. Sisson

Snow has brought the blossoms back.
The cherry is in bloom.
Fields are white with daisies now,
And weeds are topped with plume.

Spirea wears a veil and shines
As lovely as in May.
Everything, everywhere,
Blooms this snowy day.

A Royal Hackberry

MANY years ago, when only a few of the hardier American colonists had ventured across the Alleghenies, a hackberry seed was dropped and found root in the fertile soil of the Great Plains. Kept moist by a nearby river, it flourished, somehow escaping the browsing of wild animals and the hazards of Indian occupation. Taller and stronger it grew, and, had it possessed ears, it might have heard of the Boston Tea Party, the ride of Paul Revere and the American Revolution. Many years later, when it had grown into a magnificent tree, a covered wagon appeared in the distance, and the driver paused to refresh himself in its shade before moving on toward the Rockies and the West.

More wagons followed—seemingly endless chains of them—and the tree stood amid hurry and restlessness of this great army. But, not all seemed willing to continue the journey. Some stopped besides the nearby river and others joined them. Soon a city sprung up on the prairie and strange floating houses came to the river's bank. A puffing black demon on glistening rails brought hundreds more settlers.

For nearly three centuries, the tree, noticed only by the drivers of the covered wagons, the Indians who camped nearby, and the toilers who rested in its shade, had remained in the background, while human history was in the making. Then one day, in early leafless spring, a woman drove over the seldom-used roads beyond the limits of St. Louis, Missouri, in search of the beauties of Nature and came upon it, its lower trunk nearly hidden by the shoulder-high weeds. At last, it was to receive the honors it merited. Jane Holman took the news of her discovery back to other Nature lovers, and plans for its



permanent preservation began. Men wise in the needs of trees offered to look out for it. Given care, they said, the giant should survive another century or two.

Now highway engineers are changing the course of the stream that threatens to undermine the tree. Since it is located on an old strip of Indian camping ground, it has been proposed that fifty adjoining acres be acquired by the County School Board, for educational purposes for the children of St. Louis County. A heavily wooded area bordering the river makes it an ideal tract for such a plan. Its discoverer has devised a plan whereby a log cabin could be constructed by the boys to house Indian relics. Other developments would be in the hands of the boy students. A Board consisting of their own members will be established to further the study of interesting subjects in natural history. The great hackberry tree thus will be assured of care, will not have lived in vain, and man will come to praise its grandeur as the years pass by.



SILT TAKES OVER A CORN FIELD

Flooding and silt completely destroyed this crop beside the Muskingum River in Ohio. When dried out in the sun the deposit was found to be more than four inches thick

This is another article in the series on soil conservation by Mr. Collins, special assistant to the Chief of the Soil Conservation Service. Readers may be interested in the following publications available from the Superintendent of Documents, Washington, D. C., for the stated amounts in cash: *FARMING PRACTICES AND FLOOD CONTROL*, U.S.D.A. Miscellaneous Publication 253, ten cents; *LITTLE WATERS*, fifteen cents; *SOIL AND WATER CONSERVATION IN THE NORTHWEST*, U.S.D.A. Farmers' Bulletin 1773, ten cents; *PLANTS VALUABLE FOR WILDLIFE UTILIZATION AND EROSION CONTROL*, U.S.D.A. Circular 412, five cents; *SOIL CONSERVATION*, official monthly periodical of the Soil Conservation Service, ten cents a copy, one dollar a year.

TEN BILLION LITTLE DAMS is available free from the Soil Conservation Service, Washington, D. C.

Soil or Sediment?

By HENRY H. COLLINS, Jr.

GULLIES through fields, dunes on the prairie and dust storms in the air are gradually, if belatedly, making us more erosion conscious than ever before. It is now time that we became equally "siltation" conscious; for the full cycle of erosion and sedimentation, as speeded up by man, means simply this: *soil eroded from the place where it belongs is laid down as sediment in another where it does not*. Every handful of earth washed from unprotected fields must be deposited elsewhere later. These handfuls, magnified a millionfold, fill up our reservoirs, clog streams and ditches, bury fertile flood plains,

and impair the navigability of our rivers and harbors. Siltation is now a most serious phase of the erosion problem, and the one, perhaps, that is the most difficult of all to remedy.

Through millions of years of geologic time the mountains of our continent have been lowered and our valleys and lowlands built up by wind and water, frost and sun. In humid sections the action of water went on mainly under a cover of vegetation. Rain pounding on exposed surfaces had less effect on the rocks than water seeping through the overlying soil layers and mechanically and chemically attacking the solid crust beneath. Rocks were thus transmuted into soil and began their slow subsurface creep down the slopes to the streams below. In arid sections the processes of erosion, although agriculture and grazing have latterly greatly increased their severity, have always been the same. Still, the majority of the streams ran clear throughout most of the year.

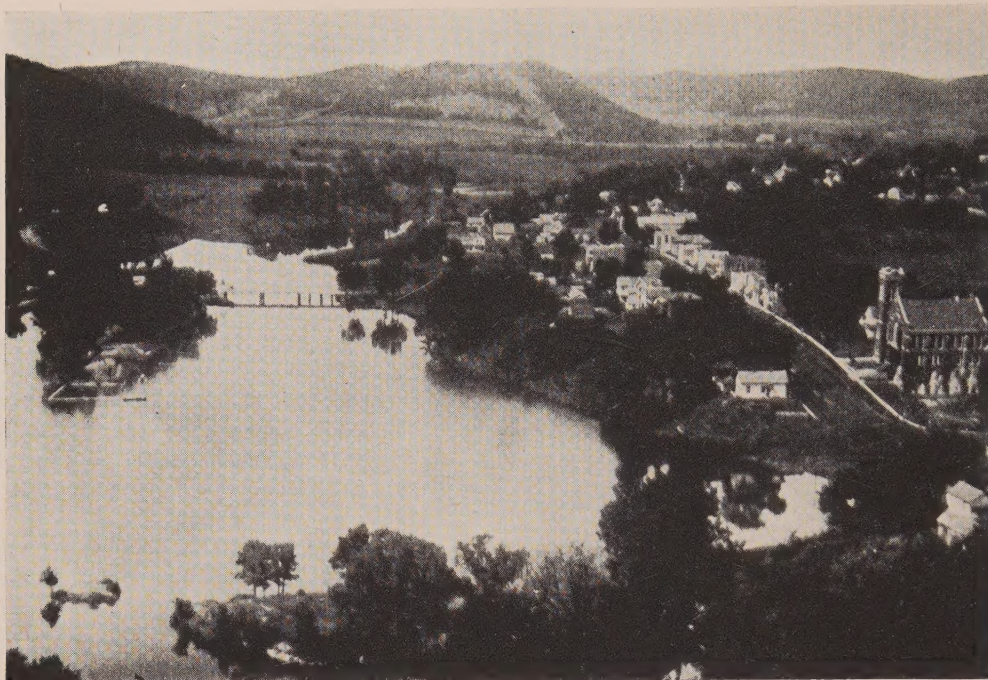
Silt, it is true, did flow at times in these river courses, but not enough to interfere with the trees and grasses that grew on their margins, with the fish that dwelt in their waters, nor with the Indians who lived from the surrounding land. However, as the forests and grasslands, with the coming of the white man, gave way to cultivated fields and overgrazed ranges, accelerated erosion set in motion forces that have completely changed our waterways and valleys. Silt now pours down in volumes unknown of old.

The most outstanding examples of man-caused sedi-



A MEASURE OF SILT DEPOSIT

Ancient tree in Roosevelt Reservoir, Arizona, shows former depth of deposit after silt had been carried down stream to the lower part of the reservoir



LAKE COMO IN
HOUSTON COUNTY,
MINNESOTA, IN
THE YEAR 1926

This famous resort was then beautified by this lake, made by a dam constructed to supply water power for railroad shops and a flour mill. The dam was built in 1922 after a dirt fill had been washed out

mentation may be found in reservoirs. The 2,400 acres of Lake Taneycomo, for instance, were formed by a power dam, built in 1913, which threw back the waters of the White River in Missouri for twenty miles upstream. In 1935 a survey disclosed that the surface area of this lake had shrunk by one-fifth, and the storage capacity by almost one-half, due to rapid erosion of the watershed. Silt had piled up not only where the stream entered the reservoir, but also under water behind the dam and throughout the entire area of the lake.

Just above Danville, Virginia, the Schoolfield Dam was constructed across the Dan River in 1904 to furnish power to textile mills nearby. At that time its backwater covered 540 acres and reached three and one-half miles upstream. Today four-fifths of the reservoir has been filled with silt. This has created an island that supports an extensive growth of forest trees, and an examination of the age and distribution of the timber on it shows that the pond contained as much silt in 1915 as it does now! Since 20% of its capacity is required for the passage of the river through its channel, this means that in the eleven years between 1904 and 1915 the reservoir had lost its entire excess storage capacity.

Irrigation reservoirs as a rule dam streams in arid regions, the watersheds of which are devoted to stock raising. Since this range land has been, and still is, rapidly eroding from overgrazing, a tremendous volume of sediment pours into such basins. One of the largest is that formed in 1916 from forty-one miles of the Rio Grande River at Elephant Butte, New Mexico. The dam, one of the sights of the West, 300 feet high and a third of a mile long, impounded, prior to the construction of Boulder Dam, the largest reservoir in the country. It is, therefore, particularly appalling to learn from a recent survey that Elephant Butte has already lost more than 13% of its original storage capacity; and at the present rate of filling, only eighty-two years will be required to reduce

that capacity to the normal annual draft, and thereafter it will rapidly become useless.

A worse situation exists in the Indian country to the north, where the Zuni Reservoir was built in 1907, also to provide irrigation water. Since then over 11,000 acre-feet of silt have been deposited in a reservoir whose original capacity was less than 15,000. As long ago as 1923 the danger had already been recognized and protective works were established to hold the silt back on the Rio de Los Nutrias, the principal silt-producing tributary; but these were insufficient. As a last resort, in 1931 a hole was blasted in the gate tower of the main dam in an effort to introduce a sluice gate for the silt, but this proved ineffective. Today the reservoir is virtually worthless.

At Spartanburg, South Carolina, a small municipal water supply reservoir was built in 1926. Loss of capacity due to siltation is proceeding at the rate of over 2% a year. This is typical of many such reservoirs through the Piedmont. Another rapidly silting municipal water supply is the lake at Olathe, Kansas, which is also losing over 2% of its original capacity yearly. Worst of all is a similar reservoir at Waco, Texas, built in 1930 at a cost of over \$2,000,000. In six years this basin had lost almost 20% of its original capacity, of which over 5% disappeared within one period of eleven months in 1936. Shortly after the survey that disclosed this tragedy, the heaviest floods on record occurred in the Brazos River valley. It is now estimated that the storage loss may run as high as 25%. Yet even if the conservative computation of the first six years' rate of silting is used, the capacity of this reservoir will be exhausted in only twenty-four years.

At Keokuk, Iowa, a combination reservoir, used both for power production and navigation control, extends forty-two miles upstream from the dam. Within less than twenty-five years 30% of its original capacity has disappeared through silting, a rate which, if continued, will seriously impair its usefulness within half a century.

IN 1936 LAKE
COMO HAD COME
TO LOOK AS
WE SEE IT HERE

Cutting of timber and intensive cultivation of the soil left little vegetation to retard runoff of rain water. Now the lake is a silted waste through which a small run meanders in place of the lake



Lake Calhoun at Galva, Illinois, is an artificial pond constructed for water sports, fishing and picnicking. A combination of forest removal, intense grazing and unwise farm practices has greatly accelerated erosion within its watershed, and has produced enough silt within thirteen years to reduce its original capacity by more than 50%. Unless remedial measures are at once adopted this reservoir will be completely filled within another fifteen years.

Not only reservoirs, but the entire length and borders of many stream courses, are also subject to damage from silting. The low-lying flood plains of our rivers constitute some of the most fertile agricultural areas in the country. Sediments caused by accelerated erosion frequently threaten these with destruction. If our present deposits were all as fine and rich as those brought down by the Nile, as indeed they probably were two hundred years ago, these plains might also, upon the withdrawal of the flood waters, blossom like the valley of Egypt. But such cases now seldom occur. With us the fertile remains of the eroded topsoil are commonly mixed with great quantities of subsoil, gravel and pebbles. Upon these little will grow; and if they are laid down upon former topsoil, that soil also is effectively put out of production.

Furthermore, sediment brought down by flood waters builds up bed deposits, as the flood subsides, throughout the length of the stream. The streambed thus raised helps the next flood to overflow the surrounding land more easily. The more the process is repeated the worse the result becomes, as in the case of the Rio Grande, where not only are agricultural lands and irrigation developments on both sides of the river menaced by flood waters, but one town, San Marcial, has even been destroyed.

Silt impedes drainage also. Referring to the sediments carried by the tributaries of the Rio Grande below Embudo, New Mexico, Bailey and Connaughton in "The Western Range" state: "This silt, carried down and de-

posited in the low-gradient channel of the Middle Valley, has so built up the channel as to slow down the flow of the river, causing the water-logging of 80,000 acres of formerly productive farm land."

In addition, the raising of a river bottom hinders navigation within the stream itself. Where piling up of sediments occurs, riverbeds are in a continuous state of flux. Sandbars and mud flats of inconstant size appear and reappear at irregular intervals, altering channels, necessitating changes in charts and greatly increasing the difficulties and expense of maintaining such waterways as fit routes for navigation.

In the West, where the contents of many reservoirs are used for irrigation, such water, if silt-laden, cannot be used, or it would soon fill up the irrigation canals. Even ordinary drainage ways may be affected. In Fremont County, Iowa, the Burlington Railway recently spent \$36,000 raising its main line seven feet to permit the construction of a ditch to carry silt directly to the Missouri River.

Salt waterways are affected too. The deposition of enormous quantities of silt in the ocean and its bays and gulfs upsets the balance of Nature in marine areas. Even the humble oyster requires clear water of a definite temperature and salinity. Where the waters covering their beds are invaded by silt, the oysters are destroyed, as recently happened to those beds in Matagorda Bay near the mouth of the Colorado River of Texas.

Silting of rivers is by no means confined to this country, although here, perhaps, it has taken place more rapidly than anywhere else in the world. The most outstanding example, however, of accelerated sedimentation is undoubtedly the bed and flood plain of the Hwang Ho, the Great Yellow River of China. The watershed of this aptly-named stream, which has been cultivated for over 4,000 years, sends down to the sea every twelve months more silt than do all the rivers of the United States. Dur-

THE FATE OF A RESERVOIR

Schoolfield Reservoir on the Dan River near Schoolfield, Va., now silted up, with a silt-made island in its center

ing many centuries its bed has been built up high above the surrounding countryside and the river is now contained in its uncertain channel only by constant attention to the height of the levees that border it.

Harbors and shore lines are also subject to silting. At the height of their power the Romans founded Ostia to serve as a port for Rome at the mouth of the Tiber. But the tawny mane of that yellow river has brought down so much soil in the last 1,800 years that Ostia is now an inland town three miles from salt water. Ravenna, safeguarded by its triple barrier of river, marsh and moat, shielded many of the later Roman Emperors from the turbulence of the legions and the intrigues of their generals. Today Ravenna is four miles from the sea and the surrounding lagoon has been filled with silt. The one-time port of Adria is now fourteen miles from shore, and in certain places the Adriatic coast line since Roman days has advanced seaward by as much as twenty miles.

The control of silting can take place effectively and permanently only by the most rigorous application of soil conservation measures on the entire drainage basin involved. Silting can best be stopped by keeping silt out of the river; for as long as it is washed down and flows into reservoirs the problem of getting it out is almost insurmountable.

A reservoir dam is invariably built at the least costly site, and it is generally erected to the maximum height permitted by its base. Hence it is usually impractical or unsafe to raise the level of an existing dam in order to provide additional storage for a silt-filled reservoir. Even where this might be possible no dam can support more than a few feet of such a superstructure.

Dredging can remove silt only at a prohibitive cost. Even were it less expensive, the problem of silt disposal would still remain. If all reservoirs were constructed amid low-lying agricultural land, and cost not considered, it might be possible for suction pumps to spread the silt in a fine film over the surrounding area. But such is seldom the case. Reservoirs are almost always constructed in natural pockets, frequently bordered by high hills. In the case of Boulder Dam, for example, the dam and most of the lake are surrounded by precipitous cliffs which might have to be surmounted by pumping lines if the silt were to be dredged out and deposited in the country on the side.

Upstream silt traps have been proposed. But silt traps are self-destroying structures and, as the originals fill up, new ones must constantly be constructed. Proposals that the silt be pumped over the dam and sent on down the river offer no solution to the excessive cost of dredging; and no answer to the problem downstream of what to do



with the additional silt, or how to clear the turbid water.

Some authorities have hoped that where clean water in the lower valley was not important, it might be possible to install a series of flood gates at the bottom of the dam to carry off the silt from time to time. Occasionally such gates have been of some use. Generally, however, the water scours out the silt directly behind a floodgate in the form of a long channel without removing the sediments from the sides. Even a series of these would still leave untouched great quantities of silt between scour channels or deposited in the irregularities in the reservoir floor. And, of course, this would still be no solution to the problem of what to do with the silt downstream.

While a reservoir is in the later stages of silting up, the adjacent or downstream communities dependent upon its power, its water or its beauty will experience a gradual retrogression. Less power or water will be available from year to year. Enterprises will curtail operations. Settlers will depart. The irrigated area will shrink as disuse crumbles the outermost ditches. Commerce that may depend upon navigation through the reservoir will diminish. Trade routes will contract. Tourists will no longer visit a mud-filled lake whose summer residents have moved away.

As industry dependent on local water power declines, so does its investment value. Employment decreases. Population falls. The resources of dependent cities grow less, and so does the incentive to rectify conditions, for only the least ambitious will remain in a sinking community. The standard of living drops throughout an entire area. Satellite towns become ghost towns.

Thus a creeping paralysis will gradually settle over such an ill-fated region, accompanied by the slow horrors of economic strangulation. A generation-long depression will set in. Foreclosures, failures and defaults will increase, along with the relief rolls and the ranks of the underfed and the underprivileged. With the certain exhaustion of the source of her dwindling income looming ever nearer, her citizens will hasten to forsake a city foredoomed to the fate of Persepolis or Ur. And finally the time will arrive when the land, wasted of its water resources, will return to a more desolate wilderness than that which greeted the first pioneer. (Continued on page 190)

A Messenger to Heaven



*The story of Ralph,
a parrot personality*

By STEPHEN HAWEIS

Illustrated by R. Bruce Horsfall

WE ARE apt to think that a bird must always be happy because it sings and flies, but while it may be nice to be able to fly, it may not be so nice to know that an owl or a hawk can fly much better—and faster. And not all songs are happy; some songs are very sad and unless you know what the words mean you may sometimes make great mistakes. Perhaps a bird that seems to be carolling of the flowers and sunshine is really complaining bitterly about the scarcity of bugs this year, and an elderly bird often slips in a verse about the size and flavor of the game being vastly inferior to those in the old days, meaning, of course, his young days. We are all a bit like that.

A bird has a hard life. It is difficult for a bird to make a living in these times, especially when there are five hungry babies in a nest somewhere, screeching until their throats are bright yellow. Cultivated grain and fruit is grossly over-protected, berries have their off-seasons and caterpillars become wiser, warier and rarer every year—or so it seems. An intelligent bird that learns to become a caged pet soon realizes that the price it pays for the sacrifice of its liberty is well worth it in security and regular meals. It is not so bad when you get accustomed to it and many a caged bird which “escapes” would give its tail feathers to be back at home after ten minutes of this freedom. Indeed, if you have treated your bird properly, the best way of catching it is to leave the cage in a conspicuous place with the “prison” door open. If it has not been too distracted by thrown stones, and the jeers and taunts of wild birds which don’t like the way it wears its feathers, you will often find your pet safe on the perch after a little while, for well it knows that the bars that prevent it from getting out also prevent enemies from getting in.

Of all caged birds none are more intelligent and take more kindly to civilization—which is cage-life—than parrots. (I am willing to admit at once that my parrot was not so remarkable as the one which belonged to your aunt.) But my parrot was (was, alas!) quite a good bird too, and did a better work in the world than I have ever done myself, for it cured a little boy of infantile paralysis. It was not the celebrated Chicago parrot whose blood was transfused into a little patient on the advice of a specialist.

“How,” asked the great man, “did that infantile paralysis case get on, about which you consulted me by telephone?”

“A marvellous recovery! How did you ever happen to discover that parrots’ blood was useful in such cases?” The humbler general practitioner was full of awe and curiosity.

“Parrots’ blood? Good heavens, you don’t mean to tell me that you made a transfusion of parrots’ blood! What I said was ‘parent’s

blood’. Well, of all things!”

No. My parrot was just an amiable, common green parrot from Venezuela—with a yellow head. It was given to a little boy to entertain him during his convalescence and it so delighted him that he was always struggling to reach the bird—it was that which effected the cure.

Of course my parrot talked, too, but I confess its conversational powers were not more distinct than those of a lot of people who clip their words at the end, slur the beginning and are not over-careful about the middle. Its best effort was “Hullo, Polly,” and even that it spelled “Hah-wo powwy.” In fact, it just made a noise like conversation from which you had to guess the meaning—the way a lot of people do.

Parrots live to great ages. It is not easy to tell how old a parrot is because at an age when you and I would be shedding our hair and teeth and criticising the younger generation, a parrot looks as good as new. Its feathers are as smooth as ever, and its beak shows no sign of receding gums, that is, not in four out of five parrots that I ever saw. It looks just the same at fifty as it did at twenty, and none of us can really do that however hard we try. But when you know a parrot intimately you can know pretty well if it is an old bird. It walks with greater circumspection, and complains more about trifles which are not really important. It misses its foothold once in a while and occasionally falls off its perch—after which it pretends to be more surprised than hurt, even when it is really more hurt than surprised.

Yes, Ralph was an old bird when he came to live with me and I dare say the little boy from whom he took his name is a sophomore at Harvard now. How time flies! Ralph was old and a little bit peevish at times. He even bit me occasionally and he took a violent, unreasonable

dislike to the brown maid who looked after most of his creature-comforts. Cecilia liked him, but for two years he tried to walk up the stick on which she carried him from his bed-cage to his tree and back again in the evenings, for Ralph used his cage only to sleep in. But at last he ceased from this enmity and allowed Cecilia to acquire merit by scratching his head. He also fell out of the tree once or twice, and once he could not get up again without assistance, which he attributed to a touch of sciatica, but I knew better. "Polly is not going to be with us very much longer," I said. He was old, though he did not look his age.

I have often wondered whether birds and animals in their wild state know when the end is near, if they make a last effort to visit their friends or to see old familiar places. Domestic animals often do. An old pug-dog, who was a friend of mine thirty years ago, struggled up and down stairs when it could hardly walk, to visit every member of the household before it came back to die at its mistress's side.



And there was a parrot in the Bahamas that walked around the luncheon table one day to visit each of its human friends and at last, squawking pitifully, climbed into my lap and died between my hands. A coincidence? Do you think so?

I was not at home when Ralph died last New Year's day. Cecilia was alone in the house, for the other servants had all been anxious to go to church for the Watch-night service. Cecilia also had been promised the day off on the last of the year: I live very far from the nearest town and she cannot often attend her church services. But when I came home and asked her if she had enjoyed her holiday, she looked a little weary and said simply: "Polly die, Sir!"

"Too bad—but the Watch-night service?"—the great event, I knew, in her year.

"Polly look so sick New Year's eve—I couldn't bear for she to die alone!"

So Cecilia did not attend the Watch-night service, but the reason was carried to Heaven on happy green wings.



AN ANCIENT MARINER

By ARTHUR H. FISHER

THE lobster is only about one-third of an inch long when it hatches, and approximately two inches long when one year old. This growth, however, means that the creature must shed his outer covering sixteen times in that short period. When he has grown to be a ten-inch lobster, he has shed about thirty times. The time between each molt undoubtedly lengthens as the lobster grows older, but the veteran pictured here must have molted many times before he reached such a ripe old age that barnacles were able to attach themselves to his enormous claws. This fellow, taken off the coast of Cape Cod, Mass., apparently became so weighted down with his years that he no longer moved about in search of food; he waited for the food to come to him, and thus became host for the large colony. The excitement of being disturbed on the sea bottom, about eighty fathoms deep, seemed more than he could stand, for he died two days after capture.

JUST BANDED AND MAD ABOUT IT

Note the band on the right leg of this Say bat taken by the bat-banders at Chester, Massachusetts

Ten Thousand Bats

By CLAY PERRY

Photographs by Arthur Palme

*Bat, bat, come under my hat
And I'll give you a piece
Of bread and cheese. . . .*

IF YOU should, on some summer evening, be able to decoy one of those flitting creatures under your sky-piece by singing this age-old charm, look closely at the right ankle of the tiny thing and you may see a diminutive aluminum bracelet wrapped about it. You will have captured one of the ten thousand bats that have been banded, like birds, in New England, during the past five years.

The chances are, however, that you will be unable to catch a flying bat, for this skin-winged creature—our only flying mammal—is about the best dodger there is. A bat can steer closer without touching you, or anything else, than the thin edge of nothing. It owes this ability, it is believed, to the marvelously delicate arrangement of its inner ear.

"Blind as a bat" is a fable, for bats are never blind; they can see in daylight as well as at night, but they do not depend entirely upon sight to dodge branches, roofs

or people. They can miss these, and even such slender obstacles as silk threads and wires, even in pitch darkness. To test their powers scientists have stretched threads and wires across the aerial paths of bats. They have even gone so far as to blind bats, and to smear their bodies with vaseline to dull the supposed sensitiveness of the skin, have clipped off the broad, mouse-like outer ears, and plugged the inner ears with cotton; and then released the bats in a room across which were stretched silken threads or fine wires, and counted the number of times that each group of treated bats hit the obstructions. The results have been compared with the dodging ability of untreated bats. These experiments have proved that no treatment appreciably increases the number of hits, save closing the inner ear canal. It was even found that blinded bats avoided the threads and wires slightly better than normal ones. These were laboratory experiments, made in the 16th century by Spallanzani, an old world scientist, and in the early part of the present century by an American.

Although it has long been known that some species of bats perform semi-annual migrations, it is only within the past few years that the most extensive studies of the subject have been made. The banding of wintering bats has been the most important method. Besides its bearing on migra-

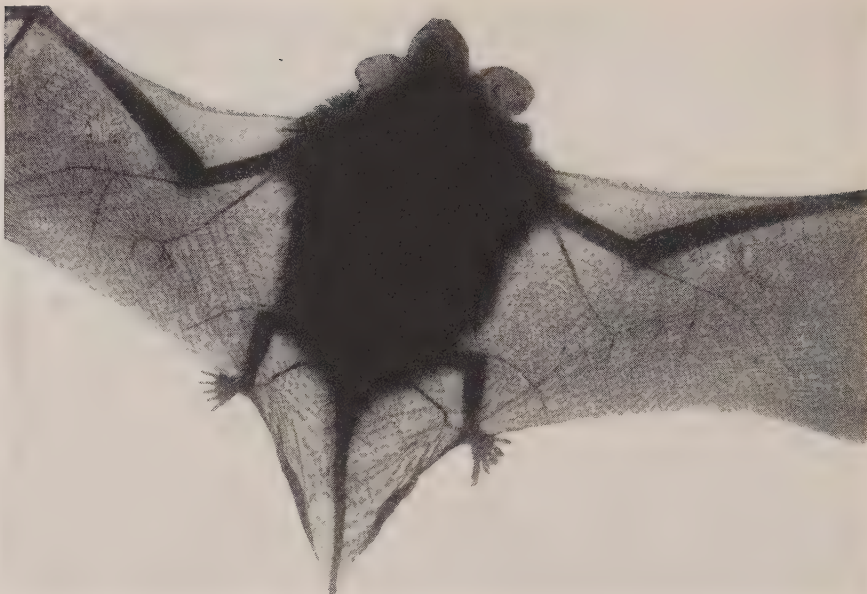
BAT-BANDERS AT WORK

In the center, hatless, is Donald R. Griffin who has captured and banded 10,000 bats since 1932. At the left is Roger Johnson and, at the right, Harold B. Hitchcock, who are placing bands and recording them, respectively. Two young Johnsons in the background look on



A LOWER VIEW OF "FIRPO"

This bat was carried home by the photographer under his head-gear. The protesting bat merely scratched Mr. Palme's scalp. "Firpo" is a big brown bat



tory habits, banding sheds light on several other problems. Some banding has been done in the West. This article concerns an important project in the East.

Donald R. Griffin of Barnstable, Massachusetts, a student at Harvard, has captured and banded 10,000 New England bats since the summer of 1932, a majority of them in cold weather while they were in a state of hibernation, hanging head down in caves and old mines. In the winter of 1936-37 he and his assistants scraped 3933 bats from the roofs and walls of such underground havens, and clasped bands on them. Dr. Mary J. Guthrie of the University of Missouri has also done a lot of bat-banding in the South, and Charles E. Mohr, of Reading, Pennsylvania, has studied bats by this method, in his state.

Mr. Griffin, however, has banded more bats for study than any other person and has discovered several interesting things hitherto unknown or unproved. His survey has covered the nine different species and sub-species of bats that frequent New England areas.

Mr. Griffin has devoted himself, since boyhood, to studying the various species of bats, especially their hibernating, migrating, breeding and homing habits, the differences in the sexes, and the preferred haunts of each species. Mr. Mohr has been capturing and studying bats for some time, in caves and mines. Both agree that the rarest bat in eastern United States appears to be the least brown bat, *Myotis subulatus leibii*. Mr. Griffin, up to last summer, had discovered only a baker's dozen of these in New England, and Mr. Mohr only fifty or sixty in a special search among thousands in Pennsylvania. Mr.

Griffin sums up the general characteristics of our bats as follows.

Our United States bats are all small, insect-eating animals. None eat fruit or flesh; none are cannibalistic as are some tropical species. They are harmless to man, woman or child; they almost never become tangled in a woman's hair or a woodsman's beard, being far too alert to be caught in such traps. They do not carry bed-bugs. In warm weather they do have parasites, but these do not transfer to humans. Bats do not carry disease, nor are their bites poisonous. The tiny teeth hardly give pain and will not draw blood from the tenderest hand. None of the North American bats suck or lap up blood, as does the dreaded vampire bat. Their erratic flight is a part of their relentless chase after insects in the air. Their wings are webs of thin skin extending between fingers and toes, and operating as an exaggerated webbed foot. They possess the homing instinct and return to their home cave or attic for distances up to sixty-five miles (perhaps farther) or from twelve miles out at sea, when deliberately taken away from their homes and released. The bands tell this tale when they are later recaptured.

There are six species of cave bats in New England; three species of tree bats. The cave bats become dormant, hanging head down in caves and mines where the temperature does not drop below freezing in winter, and freshets do not come high enough to drown them. Tree bats include the larger species, one with a wing-spread up to sixteen inches. They are seldom found in caves or buildings. Cave bats transfer in summer to regu-



LITTLE BROWN BATS HIBERNATING

These were found huddled against the top of a passage in the Chester emery mine at Chester, Massachusetts. Banding is done during the winter dormancy of the bats, which hibernate in caves and old mine workings

lar, established roosts, sometimes in colonies, mostly in old or little visited buildings that they can enter and leave through small holes close to the roof. Here the females bear their young, tuck them under their wings to nurse, and carry them (in one species as many as four at a time) in darting flights after insects, the babies hanging to the mother's fur with tiny claws.

Bat-hunting and banding requires strenuous work, such as mountain-climbing to reach high caves, squirming through narrow wet passages, wading or crawling in underground streams or enduring the intense cold and the dank air of clammy, slippery subterranean chambers. In summer it includes visiting the "maternity wards" in buildings where females establish themselves in temperatures up to 120 degrees F. The males remain outside to roost in another place. The bat-hunter must climb roofs and fasten his specially made traps over the exit holes. Then there is the task

of fitting hundreds of tiny aluminum bands furnished by the United States Biological Survey to the match-stick legs, taking care not to fold in a part of the wing-membrane. A record, of course, must be kept showing the date and place of banding of each individual, and the name of the species.

Incident to the pursuit of bats, Mr. Griffin and a dozen Harvard college undergraduates, and instructors who have assisted him, have made the rounds of most of the mountains in New England where caves or mines might offer havens for bats. The highest and most inaccessible retreat for hibernating bats is a cave atop Mt. Aeolus at Dorset, Vermont. There a large opening allows so much cold to enter, at times, that many bats die in dormancy. This cave is at an altitude of about 3000 feet. In March its steep stone floor is decorated with a field of hundreds of ice candles or "stalagmites." The bats seek safety in tiny inner chambers far from the ice-field, but winds circulate in some seasons and the cold, and perhaps the dampness that penetrates all parts of the great cavern, take an annual toll of the little hibernators.

In midsummer some of these same Aeolus bats may be found up under tar-paper roofs where the mercury may show temperatures eighty to one hundred degrees higher than their winter cave. There they stay all day, emerging at dusk to catch insects.

The three tree bats in New England are the hoary bat, red bat and silver-haired bat. The hoary bat, *Lasiurus*

cinereus, largest in New England, has a wing-spread of about sixteen inches; brown-zoned and silvery-gray fur, with the light tips scattered, produces a rippled effect of brown and silver. It is one of the rarer species.

The red bat, *Lasiurus borealis*, with bright, yellowish-red fur, is the smallest of the tree bats, and the only representative of the migratory tree bats that is even fairly common. It is the first out in the evening, and is sometimes seen winging about in the light of mid-day. The silver-haired bat, *Lasionycteris noctivagans*, a distinctly smaller species than the hoary bat, is solid black save for a sprinkling of silvery hair that gives it an appearance similar to the coat of the silver fox.

Turning to the cave bats, we mention first the big brown bat, *Eptesicus fuscus*. Its wing-spread is about eleven or twelve inches. It is dark brown in color, with short and broad ears. This insect-chaser often flies into open windows and doors after its

prey. It is about the last to cease activity in the fall.

The pipistrelle, or Georgian bat, *Pipistrellus subflavus*, is a tiny bat with a wing-spread of eight to nine inches; light, yellowish brown, with fur on back tricolor. Each hair has three different tints; dark at base, light toward the tip, and then dark at tip. It has a "frosted" look that distinguishes it from the next species, the common little brown bat, *Myotis lucifugus*. This bat is generally brown, but sometimes with a reddish-bronze tinge to the fur of the upper parts. Its wing-spread is nine to ten inches. This is the most common bat in New England, and the larger summer colonies found are usually all of this species.

The cluster or pink bat, *Myotis sodalis*, has pinkish skin. The fur is short, woolly and pinkish gray. The hind foot is smaller than in the little brown bat. It is common in Vermont caves, but is rare elsewhere in New England. It is plentiful in Pennsylvania and Indiana caves, and usually hibernates in close-packed clusters of one hundred or more.

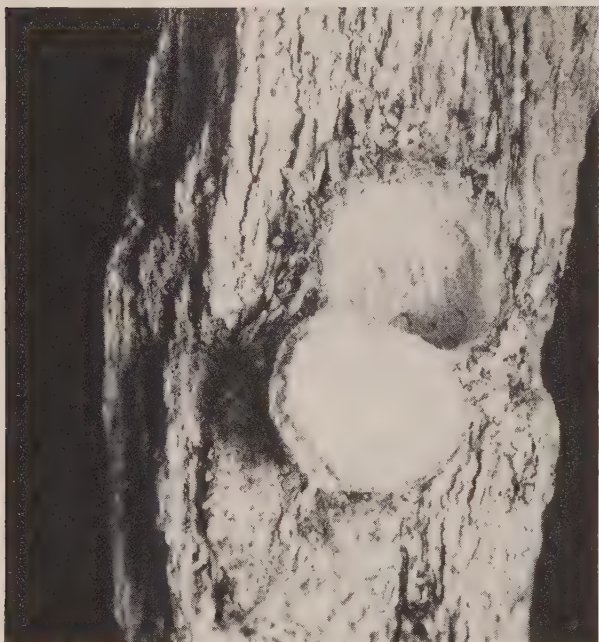
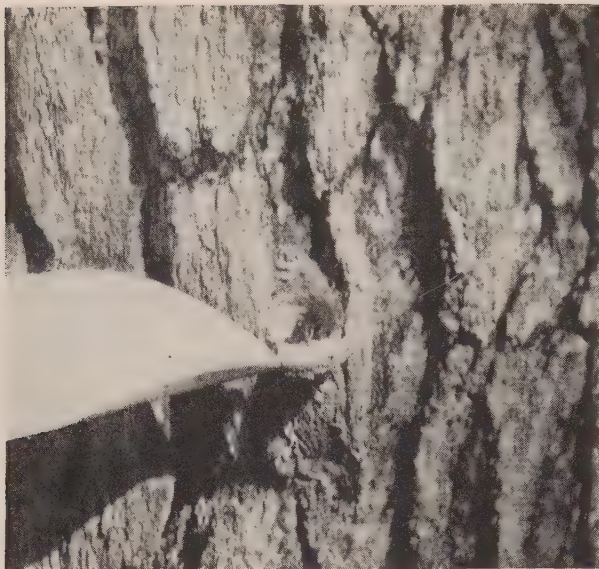
The Say bat, *Myotis keenii septentrionalis*, is much like the last two named, but has larger ears than the cluster bat. The fur is slightly coarser, and the Say bat is generally less abundant, although large colonies hibernate in old mines in western New England, as far north as upper Vermont.

The least brown bat, *Myotis subulatus leibii*, is smaller than the common little brown bat, with a rich, golden-brown color to the upper parts (Continued on page 177)



A CLOSE-UP OF A BAT

He seems ferocious, but no bats in the United States are harmful to man. In fact, they serve him through their constant warfare on flying insects, their sole food



TRAP DOORS in the TREES

*A new species of arboreal spider
found in the Belgian Congo*

By C. R. STEGALL

Uncredited photographs by the Author

TRAP-DOOR spiders have long been the object of study by naturalists of the world, and few creatures are more interesting than this tiny architect. So when an apparently new species is discovered, it is of interest to all lovers of Nature.

My first introduction to trap-door spiders was as a boy in Georgia. One morning, looking down at the hard dirt of the yard, I thought I had found a quarter. Instead it was the dew-covered, silken door of a trap-door spider, *Pachylomerus audouini*, which had abandoned her home. In so doing she opened to me the door of Nature study, which has never ceased to hold me.

Coming to live in the Belgian Congo in 1915, I often looked for dew-covered "quarter-dollars." I never found one, but in May, 1933, while searching the rough bark of a difudu tree for a species of wood louse, I found a dew-covered "dime." Three feet up on the side of the tree was a spot, a bit smaller than a dime, which I instinctively knew was the open silken door of an arboreal trap-door spider. Too excited for words, we reasoned that where there was an abandoned home there should be an occupied home nearby. So we fell to searching. But a feverish search was fruitless.

Unwilling to give in, we marked out a small section of the tree, going over it inch by inch, looking for anything out of the ordinary on the rough gray bark. After a half hour of search we found a faint, semi-circular line on the hoary bark. We probed and pricked with a needle at this half-moon-shaped affair. It moved! It opened! But it was instantly snapped back into position by a force from within! Found: a new, arboreal trap-door spider! Marking its position by sticking a colored pin in the soft bark near the nest, we carefully studied perhaps the most wonderful example of camouflage one could wish to see in Nature.

It was not, of course, a *perfect* camouflage, or it would not have been found, but it was so nearly perfect that an inexperienced eye could not locate it even when it was known to be there. The eyesight of the native people is remarkably keen, yet we found none who had seen this spider. This first nest was about three-eighths of an inch wide and seven-eighths of an inch long. Its longer di-

The tiny occupant of the trap-door home rushes to the entrance when the door is pried open with a knife blade and valiantly attempts to pull it shut. Unsuccessful, she retreats to the bottom of her nest, and . . .

ameter was vertical on the tree trunk and it was about four feet from the ground. It was laid in a depression in the bark that had been dug out by the sharp fangs of the builder. Thus the whole tubular structure was almost flush with the surrounding bark of the tree. The tube was of egg-shell thinness, made of silk spun by the spider itself.

The door that guarded its entrance lay at an angle of fifteen degrees, sloping away from the tree, so that it must have been perfectly watertight even in the hardest rain of the long wet season. The door itself was hinged with elastic silk that caused it to spring back into position, even without the aid of the occupant. The hinge was on the lower side of this sloping door, thus allowing it to open in the best position for the spider to spring out on its prey. The whole nest, including the door, was overlaid with small bits of bark and lichen taken from immediately around the nest and deftly cemented to the structure. The chief clue to the nest was a certain degree of fullness not found elsewhere on the bark. This became our guide in searching for other nests. Before the sun had set that afternoon, ten colored pins stuck in the bark showed trapdoor spider homes.

While the first nests were at a height of three to five feet, some were found only a few inches from the ground. Other nests were built as high as sixteen feet up the trunk.

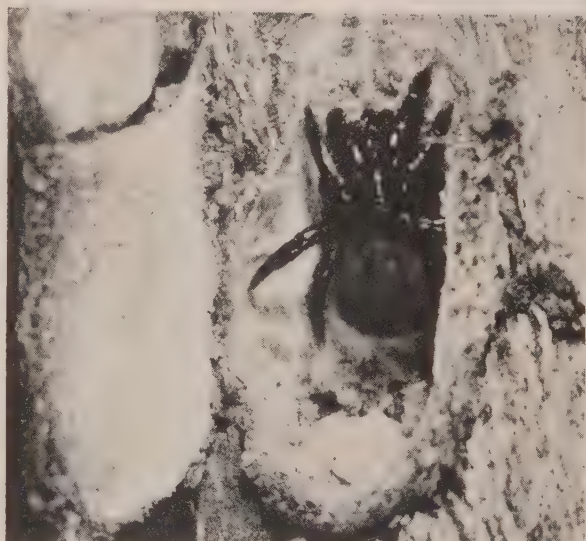
The spiders do not appear particular as to the side of the tree on which they build. One was found in the crotch of two large limbs where it undoubtedly suffered heavy drenchings during the hard rains. The owner, however, appeared prosperous.

Not all nests were the same size. The first one was what might be called a medium-sized nest. Others were appreciably larger—half again larger than the first. It was not until months later that we observed some tiny baby nests.

Now for the builder itself. First, what is its name? This stranger has no name; that is, no specific name. Specimens have been submitted to leading naturalists and entomologists in the United States, all of whom agree that it is an unrecognized species. A specialist at the Bureau of Entomology in Washington declares it to belong to the genus *Caedmon*, family Migidae.

Measurements taken on eight adult females show an average body size of about three-eighths of an inch wide and one-half inch total length. The main color is shiny black, reminding one of wet black enamel. The abdomen is not so black, having, in fact, a faint suggestion of dark purple. The legs and body are almost devoid of hair—entirely so to the unaided eye. A glass, however, reveals spines sparingly placed on the legs. Two impressed spots on the forward part of the upper side of the abdomen are of somewhat lighter hue than the remainder of the upper-side. The falces (usually erroneously termed mandibles) are only moderately developed, and while they are doubtless well adapted for holding prey, we have seen no in-

... when the danger apparently is over, she reappears to close the door. With the entire nest cut away, the owner is seen in natural resting position. This spider is harmless, as the author's daughter can testify





PHOTOGRAPH BY LEE PASSMORE

The arboreal trapdoor spider's nest is an almost perfect example of camouflage. In this enlarged photograph only a faint outline of the nest in the bark of the difudu tree can be detected. On the next page is shown

apparently lying in wait for some unwary insect to pass within striking distance. It is always ready to resist intrusion. This resistance is vigorous and determined and is accomplished by grasping the door with the falces and palpi, and bracing itself by thrusting the first and second pairs of legs overhead against the opposite side of the tube wall. In this position it holds on until it is well nigh pulled in two. The strength thus exhibited by this tiny creature is most amazing. A sewing needle, used as a pry, bends sharply under the strain. If the door is forced open, the occupant drops to the bottom of the tube, but it will frequently return several times to attempt to close its sanctuary.

Just where and when mating takes place has not yet been determined. In fact, little is known about the male of this species. It is doubtful if it builds a nest, as all nests so far discovered have been occupied by females. Two males have been observed. These are much smaller than the females, lighter in color and more active. They are quick to take refuge under the rough bark of the tree.

The eggs are deposited in a small silken sac in the bottom of the female's nest tube. These are like minute white pearls, and may number as many as two hundred. They remain in the bottom of the tube and are guarded by the mother until the babies hatch out. We observed young spiders only in April, May, June and July, the period of nearly constant temperature when the dry season replaces the rainy.

When the youngster emerges from its mother's nest, it is small indeed. Its body is actually only about one by two millimeters. But it is evidently quite well prepared to make its own way. It emerges at night, and before dawn has woven a tiny silk tube in which it lies quietly until darkness again affords it protection. Then it again sets to work, and when another dawn comes it has glued to the outer surface of its tube tiny particles of bark, making its new dwelling well nigh invisible. And it has gone its mother's home one better in that it has provided *two* doors, one at the top and one at the bottom. Both of these little doors are perfectly hinged. The baby's first effort is always a success! Surely this fact is one of the marvels of a marvelous Nature!

The baby spider resents intrusion just as its mother does. When the miniature door is opened with a needle, the shiny tot is hanging on the inside. But it does not have the bold determination of the mother. It quickly releases its hold and drops into its tubular dwelling. Then, if further disturbed, it pops out of the bottom door and, half emerged, hesitates, as if trying to remember what mother said to do under such trying circumstances. What it eats is not known; probably nothing at all except moisture for many weeks or even months. But it thrives nevertheless, and in a few months has outgrown its first home. There is evidence for belief that it has outgrown its skin, too. It proceeds to shed this and deserts the home,

dication of their being used for defense. In fact, the creatures are most shy and retiring in all their habits. During four years of observation, many have been held in the hand without one offering any resistance or putting on any show of fight. Some of them "play possum"; others crawl for a dark or secluded spot, as, for instance, between the fingers. So retiring are they that it may be doubted if one ever voluntarily sees the light of day. Not one was ever observed to leave its nest of its own accord.

In common with other trapdoor spiders, this species provides its home with a silken elastic cord that holds the door shut. But if forced to leave its home, when it allows the door to snap shut behind it, it has no difficulty in raising the door again and entering. Once inside it seems to spend its whole time with its head to the door

... the same nest cut away. These two pictures were taken by Lee Passmore, well known photographer of San Diego, California, to whom several specimens of this newly discovered species were sent by the author

building a new tube some inches, or perhaps as far as two feet, away from the first one. This new home has only one door, as if the youngster feels that she is now able to meet all enemies at the front door without having to retreat through the back. The new home is several times larger than the first, for it must last her nearly a year. By that time she has outgrown skin and home again, and once more goes through the moulting and home-building processes. Now she has reached maturity and is ready for life's functions.

We have seen spiders build new homes within a few inches of good deserted ones. One would imagine that these vacant residences with open doors would be welcomed by the new-home builder, and that she would be pleased to move in, perhaps doing a little refinishing or repairing here and there. But no! When a nest is once deserted, it is abandoned forever and eventually goes to pieces.

So far only one locality has yielded these spiders, although diligent search has been made in many sections, hundreds of miles apart. In the one locality where they were discovered they were found only on two individual trees. These were about one hundred yards apart and were both *difudus*. Although several other trees of the same species were nearby, not a spider was found on any one of them. Many other species of trees have been examined in vain. Even on the two trees that held spiders they were not abundant. Four were found on one tree and sixteen on the other.

Two factors, at least, tend to cause this rarity. The first is that, from a sac of perhaps two hundred eggs, only a few young survive. Only four or five young emerge from the parent nest and build for themselves. If, as appears, the spider inhabits only the *difudu* tree, this is one that is subject to the intense heat of the annual grass fires, which kill all life on the trees without damaging them, for it is a plains tree. No trapdoor spider could survive such an event. The two trees on which our spiders were found are old ones growing in the center of an ancient village site where, for at least a century, no fire has reached.

Most spiders are hungry feeders, but not so our dainty new trapdoor friend. Many hours we vainly spent with eyes glued to the nest in the hope of seeing its owner feed. Various insects have been guided gently across the door of the nest without causing the occupant to open it. Even "forced feeding" has been tried. We dropped a succulent termite into the nest. Instantly the door popped open, out flew the termite, and the door popped shut again—as if the spider had said: "No, thanks! I'm dieting today!"

Late in the afternoon, and sometimes at night, we have seen the doors ever so slightly ajar as if the occupant were standing with ear to crack listening for the zephyr-like footfall of some unsuspecting white ant as it plodded its



PHOTOGRAPH BY LEE PASSMORE

weary way homeward. But never have we been fortunate enough to catch one in the act of pouncing on its prey.

We have never seen the female leave her nest to forage for her food. In fact, it is doubted that she could catch an insect anywhere save at her own front door, for when forced from her nest she seems clumsy and uncertain in her movements, crawling along slowly, as if unaccustomed to the exercise—as, in fact, she is.

But we know that this spider can go for comparatively long periods without food. Two live specimens were sent to California in a tin container. Although packed tightly in this box for two months, they arrived not only alive but quite frisky. A female has been kept in a small box on my desk for observation and photographing. She has never undertaken to build a nest in the box but she does

constantly spin random, uncoordinated masses of silk about the inside of the box. She has been offered various items. House flies are refused; ants occasionally accepted.

Like other members of the family to which this new spider belongs, it has the ability to grow a new leg or feeler when an old one is lost. Some months ago, while lifting an adult female from her nest with tweezers, we unfortunately broke off one of her legs. A recent examination disclosed a new leg taking its place—a perfect leg, although still too small to be entirely efficient.

This spider is most cleanly in its habits. Not only is its body always clean and shiny, but also is its home. The tiny silken tube is kept well repaired and camouflaged outside, spotlessly clean and white inside. Not a trace of foreign matter is allowed to accumulate within.

We do not know much about our new friend as yet, but all we do know is thoroughly pleasing—even fascinating; and the friendship is still in its infancy. We hope it lasts many years and that the spider finds us as humble and industrious, as inoffensive and faithful, as we find her.



TWO OF THE
CANARY-GRASSES

Cone-shaped head of the true Canary-grass from which bird seed comes, and, at the right, a stand of reed Canary-grass, a grass of the wet places



Canary-Grasses

By F. LAMSON-SCRIBNER

Photographs by the Author

THE GREAT Swedish botanist, Linnaeus, more than one hundred and eighty years ago, named the two grasses cited here. They are both natives of Europe. One now extends across the cooler regions of Asia and North America; the other is native in southern Europe and the Canary Islands.

Doubtless the "Father of Botany" had specimens of the grass from the Canary Islands, because he named it *Phalaris canariensis*, meaning the shiny-seeded grass from the Canaries, hence our English name Canary-grass for this small group of Phalarideae.

The true Canary-grass (*Phalaris canariensis*) is a slender annual plant, usually about two feet high with somewhat inflated upper leaf-sheaths and an interesting cone-like head about an inch long. It is this grass that furnishes the commercial supply of bird seed. It is cultivated in Europe for this purpose. Through the use of the seed, it has become widely distributed in the United States, growing spontaneously in waste grounds about buildings and roadsides, blooming in May and June in the latitude of Washington. The seeds yield a flour from which "weaver's glue" is made. This is used in certain processes of cotton manufacture, and, more rarely, in making cake.

Reed Canary-grass, *Phalaris arundinacea*, is a stout leafy perennial, with strong creeping root-stocks and

coarse reed-like stems. Two to four or five feet high with a narrow panicle or head four to eight inches long. This grass belongs to the species loving water and damp places. In the northwestern states and Canada it often occupies low, wet meadow lands of great extent, to the exclusion of all other vegetation. Its root system renders it a valuable grass for holding river and stream embankments or other lands subject to water erosion.

A variety of reed Canary-grass (variety *picta*) is often seen in our gardens, as a border plant, being grown for its foliage which is beautifully-striped longitudinally with white and green bands. It is truly most decorative.



ATTRACTIVE QUICKLY GROWING SHRUBS CONCEAL THE BARE SPOTS

Common mock-oranges frame the doorway; honeysuckle, to the left of the open door at the right, softens a bit of bare wall. This is the living room terrace of the author's home

FAST GROWING SHRUBS

Quick screening of fences, garages and other objectionable structures is possible if right plants are chosen to perform this service

By VICTOR H. RIES

JUST as people expect paint to dry and be ready to use in a few hours, just so they expect almost instantaneous effects from the shrubs they plant. They cannot wait for Nature to take its course, nor are they willing to spend the necessary money to buy large-size shrubs for immediate effect.

But there are many legitimate cases where we desire our shrubs to produce results as quickly as possible. Suppose, for instance, we have just purchased a home that has nothing planted, and we are naturally desirous to obtain a pleasing effect as quickly as possible. Ordinarily this would take four to five years, but by the use of the proper shrubs we can get surprising results in from two to three years. Or say our neighbors have just built a new garage or an addition to their house that we desire to screen from our view. Here again we naturally wish relatively quick results. Or possibly the vacant lot next door or in back of us has become an unsightly weed patch, or is being used as a neighborhood playground. Here again quick growing shrubs are truly necessary.

But before we consider the shrubs themselves, we must consider their environment, the amount of sunlight available, the soil, the climate, the drainage, the presence of trees, the care we are going to give them. For after all, the fastest growing of shrubs, if planted under adverse conditions, will not give the anticipated results. So we see that the soil is not the only factor. Tree roots will rob the soil of moisture and fertility at the expense of the shrubs, poor drainage will handicap those not adapted to such conditions, lack of adequate sunlight will check those unable to grow without an abundance of it. Some shrubs are not sufficiently hardy for all climates, as for example the California privet that is so widely and so thoughtlessly planted in the northern states, where it winter-kills more or less regularly.

Besides all of these things, the way the shrubs are planted, whether with the roots jammed into a small hole or properly spread out in a large hole, may be a limiting factor. The application of additional water in copious amounts during the summer, unless it be unusual-

ly moist, and the conservation of moisture by a heavy layer of straw, peat moss or similar material as a mulch, both help to do their bit in securing maximum growth.

An example of the soil not being the only fault comes to my mind. Plantings in two barnyards a few miles apart—the one rich bottom land soil, the other poor hilltop soil. Both plantings were made at the same time, with the same kind of shrubs from the same nursery, and yet at the end of two years the planting in poor soil was much better than the planting in good soil. The entire difference was in the care given the shrubs after planting. The heavy mulch of strawy manure applied to the planting in the poorer soil made the difference in growth between these two plantings.

Still another factor often overlooked is the competition of grass, either as a lawn or as a weed growth, taking as it does both moisture and fertility almost as badly as do trees. This easily can be remedied by removing this grass from around each shrub, or, better still, spading each group of shrubs up to form a big bed. Then mulch should be applied to keep down grass and weeds as well as to conserve moisture.

One last suggestion is the application of fertilizer to the soil. The ideal way is to spread a complete commercial fertilizer with 4% nitrogen, 12% phosphorus and 4% potash (this is the usual analysis of garden fertilizers offered under various trade names) over the surface of the soil and spade it in before planting. But since it is harder to dig the holes in spaded ground, most people plant the shrubs in good top soil and then spread the fertilizer over the surface. This may be spaded in before applying the mulch. Incidentally, this mulch is of far more value in summer than in winter. If barnyard manure is used as a mulch the commercial fertilizer is not necessary. Incidentally, the fertilizer should be applied every spring for several years.

And now, having made sure that we will treat our shrubs properly, we can choose those that will give us the results we desire. Fast growth is usually a vigorous growth and so we find the majority of fast growing shrubs are tall ones, often 8 to 12 feet high. Likewise, most of them are fairly spreading in their habits, so we must remember not to plant them where they will become a nuisance as they reach their mature size in from 3 to 5 years.

Some shrubs seem to have the ability to become



HIDING A BARN WITH RAPID GROWERS

Seven years' growth of a six-foot Simon poplar completely screens the gable end of a large dairy barn

sufficiently well rooted to start growing the first year, others take at least a year before they really start to grow and some stand still for several years. Naturally we will want to select those from the first group, which will unfortunately leave out the many fine viburnums, most of the lilacs and many others. But these we can fill in where we desire less rapid results.

It is difficult to say any one shrub or group of shrubs is faster growing than others, but, in general, the bush honeysuckles, *Lonicera*, are among the most reliable, although even here a few are slow in getting under way.

As first choice in speed we will have to select the Maack honeysuckle, *Lonicera maackii*, a glorious shrub with glossy dark green leaves that stay on until most other shrubs have shed. The small red berries are produced much later than most other honeysuckles, but stay on all winter. The shrub grows more or less umbrella-shaped, spreading out as it rises until it is two to (Continued on page 183)



SHRUBS FOR THE SCHOOL

Shown here are the results of three years' growth on well-cared-for school grounds

Better Management of Predatory and Fur-bearing Mammals

By VERNON BAILEY

Photographs by the Author

NOW THAT the larger carnivores are reduced to scattered individuals, well off the farm and stock ranges—the grizzly bears limited mainly to a few in the large National Parks, cougars to rough and little used mountain areas and the big wolves to the borders of Mexico and Canada—we have mainly coyotes and bobcats to consider as enemies of game and the smaller livestock, sheep and poultry. These are both valuable fur bearers, perfectly able to pay for their own regulation where and when it is necessary, so our problems in control of predatory mammals are of little importance, except in Alaska and some local areas where the rarer game animals are being protected or reinstated. The most important matter now is to determine the kinds and numbers of different forms of wildlife that we wish to perpetuate and the best methods of saving the valuable, interesting and attractive forms.

The time is past when a minority of sportsmen, hunters and killers can dominate outdoor policies and dictate to the great majority—Nature lovers who are beginning to claim their right to a voice in maintaining some of the natural environment and interests of our adopted land. We are beginning to realize the disgrace of allowing any of our native species of birds or mammals to become extinct and their values thus lost to future generations.

Vernon Bailey is retired Chief Naturalist of the United States Bureau of Biological Survey, and, with Mrs. Bailey, is widely known in the field of natural history. For many years Mr. Bailey has been experimenting in devising humane traps in the hope that their use might mitigate the cruelty that results from traps now commonly used in the capture of fur bearers and in predatory animal control. While improvement is still being sought with some of the traps, others have been proved efficient and humane. The illustrations that accompany this article show certain of these traps that have been put in actual use.

That some aggressive species must, in some places, be reduced in abundance for the good of many smaller and weaker types goes without saying, but if our intelligence is higher than that of the beasts let us use it for the good of all, and especially with a long look into the future.

In most cases, killing has gone too far. What we need on that activity is four-wheel brakes. Then must come careful upbuilding on the meager remains of what was once a rich heritage of living things.

Many varieties or geographical races of mammals have been wiped out of existence, especially over the eastern and middle United States, but in most cases closely related forms are still to be found in some part of the country.

The eastern forms of the buffalo, elk, cougar and wolf, and the giant mink, have gone with the heath hen and passenger pigeon, but all except the pigeon have close relatives farther west. The grizzly bears in the West have suffered much because they were not good mixers and refused to accept the supremacy of the white man or respect his rights of ownership in beef and mutton. But for firearms and traps of steel, the grizzlies would have held their own as they did with the Red Man for ages back. At present they are a great attraction in Yellowstone and Glacier National Parks, where they have found, let us hope, a permanent place in the life of the Nation.

Black bears are still widely distributed, and in many sections of the country are increasing under tardy appreciation and protection. Still, in many states they are outlawed, and are hunted and trapped at all seasons by methods cruel, wasteful and unfair. In other states, they are now considered among the most valuable game animals, and are highly prized for trophies, as they were long ago for meat and fat and warm fur by the



THE VERBAL TRAP IS HARMLESS

This friendly farm dog that stumbled into the trap during the night was released the next morning, none the worse for his experience, although doubtless quite disgusted



NOTHING HURT BUT HIS PRIDE

Apparently much ashamed of himself, this gray fox was found fast in a Verbaal trap. He was released, uninjured, the same day

some of the more cautious grow up to defy the trappers and perpetuate the species.

They are fond of mutton and any small domestic stock, of poultry, game birds, rabbits, rodents, birds, eggs, reptiles, fishes, fruits, nuts, grain and even insects. With such a range of food habits they readily adapt themselves to varied types of country and climate from the Tropics to the Arctic, and thrive where the less versatile carnivores have disappeared. They offer a real problem, for in some types of farm country they are highly useful to man in controlling his greatest enemies, the rodents. In other extensive desert areas they are neutral and rarely in reach of man-made industries, and again, in game-filled forest areas and rich grazing grounds, they may cause heavy losses of valuable game and livestock. To condemn them wholly is ignorant and unwise; to protect them wholly would be fatally destructive to the property of thousands of people. To tell the truth about them, to regulate their control and to point out the simplest, most intelligent and most humane methods of bringing it about, should be the work of those who have given the most time and study to the lives of our native animals.

Most of the carnivores, large and small, have more or less valuable fur coats that yield ample reward for their capture, and these have driven well nigh to extinction several of the more valuable species. Even coyotes and foxes, the most prolific and elusive of the fur bearers, are generally of sufficient value to cover the cost of keeping

native Indians. We can hardly blame the early white settlers for killing black bears on sight, for they were always fond of pigs and sheep, the only animals slow enough for them to capture, and in many cases the loss of a few of these farm animals seriously depleted the winter food supply for the pioneer family. This enmity, justified in early days, has now little excuse for continuance, and the bears can be welcomed back to wilderness areas where wild foods are available.

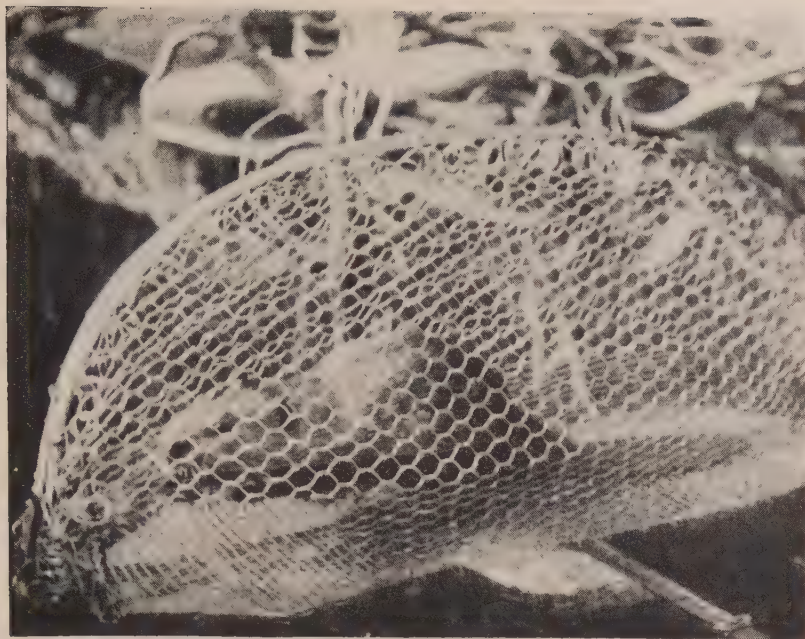
Mountain lions and big wolves will never be brought back into settled areas, since their ravages were too serious to be endured, but a few can be left in extensive wilderness regions where abundance of large game species will afford the heavy meat supply necessary for their subsistence. There is, however, always a feeling of conflict between our human epicures and these wild meat eaters that may some day reach a climax, but while the supply is ample for both we need not worry. These animals are easily controlled and we need only decide on how many we want, and where and how they are to be maintained.

Coyotes, the little wolves, are still with us over practically their whole native range, and more, for they are spreading eastward and northward far beyond their original bounds. Their intelligence, cunning and adaptability are almost uncanny, as they meet every device and lure of the trappers with perfect understanding and disregard. Those outwitted by trappers are mostly the young of the year and the less keen of the family. Almost invariably

A BOBCAT THAT DIDN'T LEARN

Once was not enough for this California bobcat. Released uninjured, he returned the next night and stepped into the same trap again





A TRAP WITH PLENTY OF ROOM

This 55-pound beaver was captured in a cage trap, kept for a few days for study, and then returned to his home lake without incident

their numbers within bounds. Over wide areas they are the main harvest of the trappers, and if they were more abundant the trappers would rapidly increase in numbers. We need not worry about them except to educate the trappers to use more humane methods in securing their furs.

Other fur bearers, however, are the cause for serious worry. The badger, for instance, one of our most harmless and useful animals, is in great danger of total extinction if the price of its fur remains at its present high level. Only in recent years has the beauty of its light-colored, long, open and lively fur been appreciated—too much so. Badgers are never abundant, as they are not prolific; they are defenseless and harmless, and easily trapped. Some day they will be raised for fur, and only the choice and beautiful strains will be produced, and then it is to be hoped that the darker brown and plain-colored badgers over most of the country can live in peace and carry on their life-long and useful pursuit of ground squirrels, gophers and mice.

Of the weasel family only the badger and wolverine have ever been considered predatory in the sense of being destructive to game or livestock, but neither of these can be justly classed as harmful. The wolverine or glutton is a powerful and savage little animal, but he is foredoomed by his short legs to be a scavenger, a killer of cripples and a robber of traps. His long, coarse fur, however, has a beauty and value that has led to his destruction over most of his range, and unless given some protection his species will soon become extinct. In parts of Canada and Alaska there are still a few, and in the Yosemite region

of California there may still be a small number. Both badgers and wolverines now should be given the protection accorded the smaller fur bearers, and over much of their ranges complete protection for a term of years, until they are well reinstated, is necessary.

Our civilization, such as it is, has swept across the continent and rolled back upon itself, leaving a cyclonic wreck of some of our most valuable natural resources. The large game and flesh-eating animals are among those that have suffered most, but now, with better perspective, we can see the value of each species and plan its future management.

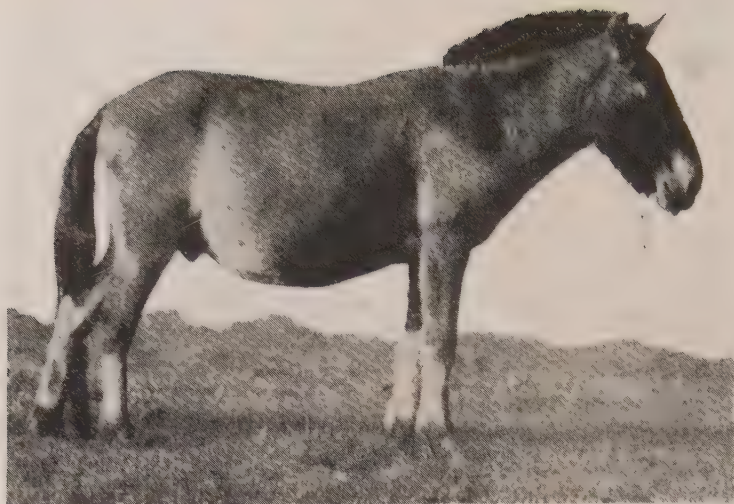
The buffalo, muskox, mountain sheep, antelope, elk and deer are being provided with suitable ranges and given a chance for reestablishment. The beaver and muskrat, among fur bearers, are being given state and private protection as definite resources; the fox,

mink, raccoon, and skunk are being raised as domestic animals for their fur, while the domestication of the marten, fisher, otter and badger are still in the experimental stage.

The larger carnivores, with less valuable fur, seem less promising for domestication. Bears, wolves, coyotes and the larger native cats require meat, and would soon eat their heads off in domestication. While no longer a general menace to game and livestock, they must be watched and not allowed on certain areas where rare species of game animals are being protected. With better traps, they can be easily controlled and their abundance can be regulated, or they can be taken in one locality and removed to another as desired.

The time has come when each of our wildlife species should be definitely managed or controlled privately and publicly, and not have its chance of survival depend on the will of the strongest and most aggressive or on the whim of the hunter or avarice of the trapper. Wildlife is a rich heritage that should be wisely maintained and, in suitable areas, intelligently restored.

With the present necessity of managing our animals more intelligently, it has become important to devise types of traps that will take them without injury and make it possible to select and redistribute them for breeding and restocking purposes. Such traps are now available for most of our native land mammals, either for capture alive without injury or, in the case of the smaller kinds, for killing instantly without cruelty. Most of these traps have been demonstrated and thoroughly tested, others are in experimental stages, and will be modified as actual tests show the necessity for changes to improve their performance.



THE ANCESTOR OF THE DOMESTIC HORSE

The wild pony, or Przewalski's horse, of Mongolia. Note its large head and convex profile, upright mane, scantily-haired tail, white muzzle and pale legs

THE STORY OF THE HORSE

Although its origin is hidden in the mists of the past, the horse is believed to have come from Central Asia

By ERNST SCHWARZ

LONG before Columbus ventured into a new world; indeed, half a million years ago, during the last great invasion of the ice, there were horses on what we now know as the continent of North America. Man had not yet made his appearance here, and these animals were, of course, wild horses. Some of them were, in fact, of the same stock as those now found in Europe and Asia. By some mysterious agent, most probably an epidemic, they were destroyed. They vanished from the great plains long before man had crossed the straits that separate Asia from North America. The record remains.

In the Old World the history of the horse has been different. Even today wild ponies are found in Mongolia, survivors of the hordes of primitive horses that roamed all over northern Asia and Europe, and whose remains abound in the deposits left by the great glaciers. Yet the descendants of these wild equine tribes are with us today, friends and servants of man. And in the centuries that have passed they have been developed by him into widely different types and breeds that differ one from another even more than they do from their wild ancestors.

The wild horse that still survives in Mongolia is a pale brown animal of medium size. It has slender limbs, a heavy and ugly head, and an upright mane. Far different are these animals from the elegant Barb and Arab horses, or the heavy cart-horses of northern Europe, or the great tournament horses of the Middle Ages.

The story of the domestication of the horse is, of course, shrouded in the mists of antiquity. We do not know when it became attached to man. But the facts that wild horses are still found in north-



THE RACE-HORSE OF TODAY

Gallant Fox, one of the most successful of the American thoroughbreds of recent years, poses complacently for his statue



A HORSE WITH A PERMANENT WAVE

This exceptional horse belongs to the curly-haired breed of the Bashkirs, and comes from the plains of eastern Russia

Although derived from a single wild stock, the northern horse and the southern are distinct one from another. Indeed, when you find a single tooth of either of them, as you do in superficial deposits in the Spanish Peninsula, you know the breed at a glance. The two also differ widely in shape, in temperament, and in the way they stand the climate. But why the two strains have arisen, and where they become separate, is another thing we do not know.

It was the possession of horses that, in early times, decided the history of peoples and continents, just as planes, tanks and heavy guns determine it now.

ern Asia, and that small, primitive horses nearly akin to them still abound there in domestication, have led to the assumption that the steppes of Central Asia are the real ancestral home of the domestic horse. Actually, all that we know is that the horse is said to have come to Mesopotamia from Persia; that the first actual records we have are from Mesopotamia, and that they date back to about 2500 B.C.

About eight hundred years after this date the horse was brought to Egypt. From there, apparently, it spread all over northern Africa, finally reaching the Atlantic. From these horses came the noblemen of their tribe—the Barb, the Arab, and their offspring the Thoroughbred. Strangely enough, the Arab horse is of comparatively recent origin. It was brought to Arabia in the early centuries of the Christian era and soon became the highly efficient breed that has meant so much in the history of Islam.

But not by this route did the horse reach northern Europe. Like most domestic animals, the horse arrived there more directly from Asia. Of its coming there is no record, but we do know that the racial type of the early European horse closely resembles that still persisting in the small shaggy ponies of the Sarmatian and Siberian plains. Thus there seems to be no doubt from where it was introduced, and who originally bred it. The Mongolian people have been born horsemen down through time. The horse, then, came to Central Europe rather late, not before the Bronze Age.

It was his Numidian cavalry that made Hannibal master of Italy in the early years of the Punian wars. It was their horses that enabled the Mongolian conquerors, again and again, to invade Europe. It was the superior horses they had bred that made the Arabs spread like wildfire all over the Eastern world. Without them they would never have moved out of their desert home. And without the Arabian conquest, and the spread of Islam, the world would look rather different today.

All this makes an interesting story. It would make a more thrilling one if we knew all about it. As it is, we have only a fragmentary record, because no skeletal remains have been preserved from anywhere in the Mediterranean area. In digging for rock engravings, ruins and pottery, it seems that archaeologists have not bothered about animal bones. In fact they have themselves destroyed much evidence that would have helped their own horizons.

We do know, of course, all of the history of domestic horses in America. We know that they were introduced



A STRANGE CROSS

Offspring of a wild Mongolian pony and a Russian pony. Note its slightly hanging mane and its interesting black "stockings"

by the Spaniards, in both the northern and southern hemispheres. We know how they were turned loose, and became feral; how the Indians, in almost no time, became

perfect horsemen. Finally, with the spread of agriculture and the other arts of civilization, not only was the Indian driven back, but his half-wild horse perished.

ANT-KILLING FUNGUS

By M. R. SMITH

PRACTICALLY no animal or plant is free from the attacks of parasites, and ants are no exception to this rule, although comparatively speaking there are fewer parasites of ants than almost any other animal, if we consider the immense number of species and individual ants that exist. Dr. W. M. Wheeler of Harvard, a world authority on these insects, states that ants are the most numerous of all insects and are to be encountered from the tropics almost to the Arctic zone, and from the sands of the seashore to the tops of the highest mountains. Their wide distribution, also their abundance in both species and individuals, should make them more liable to attack from parasites than any other animal.

Perhaps their escape from parasitism may be due largely to their agility in evading animal parasites, and to their cleanliness in the case of fungus parasites. It is a known fact that ants constantly lick themselves, thus removing many harmful germs that might otherwise affect them.

Although the writer has examined thousands upon thousands of ants from all parts of North America over a long period of years, he has encountered only two species of parasitic fungi affecting them. Both of these, strange to say, are limited to only a small number of host species. One species of fungus appears on the ants like small grains of sand adhering to their bodies. When this fungus is examined carefully under the microscope it is found to be strands of hyphae arranged in tree-like growths. There is no common name for the fungus, but it is technically known as *Laboulbenia formicarum*. Usually the fungus is found growing most abundantly on the legs or stomach of the ant, but in severe cases it has been noted growing from the eyes of the affected individuals. One would think that a heavily infected ant would eventually succumb from the effects of the fungus, but this apparently is rarely the case. On numerous occasions the writer has captured infected individuals, yet to all appearances they were as lively as noninfected specimens.

A fungus that does kill the ant it attacks is shown in



EVEN THE CLEANLY ANT IS SOMETIMES ATTACKED BY PARASITES

This peculiar stem-like growth began on the neck of the insect, decapitating it during its development. The round object is the fruiting body of the fungus

the accompanying illustration. Close inspection of the picture will show a main stalk-like process of the fungus protruding from the region between the head and neck of the affected ant. It will be noted that the fungus has not only killed the ant, but has practically decapitated it. On the trunk of the fungus will be seen a prominent, oval body, the fruiting part. This organ, when fully mature, liberates thousands upon thousands of viable spores, some of which are bound to alight on the bodies of other ants and thus infect them.

After settling on the body of an ant, the fungus sends a growth into its body that finally develops into the mature form as pictured above. In a small patch of woodland hundreds of dead ants were found, all killed by this fungus. Most of the ants had died clinging to branches and stems of plants with their backs to the ground. According to the late Dr. Roland Thaxter, an authority on insect-attacking fungi, the fungus just described is known as *Cordyceps unilateralis*, a species that has been noted so far only in the Southern States, where it attacks only two kinds of ants, both of which belong to the common carpenter ant group. Related species are found elsewhere, especially in the tropics, and such species attack other hosts.

★ Conservation ★

A part of Nature Magazine each month is devoted to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.



VERMONT AND BILLBOARDS

Regulation of size and place, zoning, licensing and other legal devices play their part in check-

ing the billboard nuisance. One of the most effective weapons against these parasitic growths, however, is still the economic argument—the sincere indignation of the consumer against both the rural billboard and the wares it advertises. “I favor products not advertised on the landscape” is the slogan and the policy of a rapidly growing body of citizens. More and more advertisers are coming to appreciate the danger of using a form of offensive advertising.

Vermont provides us with the most recent example of consumer rebellion against billboards. Until recently the Green Mountain State was amazingly free of billboards and roadside slums. This was because the State formerly had few hard-surfaced roads to lure the tourist. Now there are 1767 miles of improved roads, a large share of them modern highways. Vermont has begun to advertise her scenic beauties. With these policies have come the billboards. A total of 744 large billboards existed in 1936. Of these 589 were poster boards. In 1937, fifty-eight new poster boards appeared. This is a more than ten per cent gain, which is large in a small and scenic state where practically all posters are in purely rural locations.

The unfortunate advertiser is, in most cases, a victim of circumstance. Space on these boards is sold to him as “commercial” and without reference to specific boards or locations. But anyone who knows Vermont knows also that a billboard placed a half-mile outside a village is in a purely rural place. And that is where most of Vermont’s boards are.

The billboard people were going along merrily, encountering only unorganized displeasure until they put

up seven of the big new poster boards on the approaches to the lovely village of Springfield. The community had never before known the indignity of a billboard. So here was born the Vermont Association for Billboard Restriction. An artist, Mr. Horace Brown, took the lead. He organized a committee of men from all parts of the State, many of them active in State affairs. They turned to the situation at Springfield as a means of demonstrating a plan of action; as a means of suggesting the course to be followed by other communities.

In Springfield a local committee of six—three men and three women—was formed. It represented the Garden Club, the D.A.R., the Grange, the Rotary Club and other local groups. As soon as posters appeared on the billboards, a list of the advertisers, the addresses of their sales departments, or the name of a local dealer in whose care a letter might be written, was given to a group of citizens. Letters were written protesting against the ruin of the approaches to Springfield. The local dealers in the products were approached and shown that the billboards were hurting rather than helping their businesses.

When the first letters went out there were four national advertisers appearing on the seven boards. After a month there were only two; after two more months, only one. In their place appeared advertisements of banks or real estate companies operating in the county. It was not difficult to show the advertisers that they were incurring ill-will instead of good-will.

It was found that letters to advertisers have a far greater carrying power than many people suspect. These letters are passed on to the advertising agency that advised using billboards, usually questioning the wisdom of this advice. The agency, in turn, passes this on to the National Association of Outdoor Advertisers of America, so the protest gets back to the billboard company, leaving a trail of

distrust of the outdoor advertising medium in its wake.

The billboard company has fought back viciously; it has tried the usual "red herrings" and promises. It has attacked the new Association in the face of its active support by the newspapers and by many State-wide organizations including the State Grange, the State Farm Bureau, the Vermont Hotel Association, and many leading citizens. In other words, "the public be fooled if possible—if not, let it be damned" tactics of the billboard industry are being used in Vermont as elsewhere.

Already, however, the Springfield plan is beginning to

spread. Other Vermont communities will follow suit. Legislation will be sought at the 1939 session of the Legislature.

In common with the National Roadside Council, the American Nature Association has long urged the efficacy of this direct approach to the advertiser. It is encouraging to note that protests are being invoked, on a State-wide basis, in both Virginia and Pennsylvania. It is the right of any individual citizen to protest against these unsightly and dangerous exploitations of the environs of the highways we are all heavily taxed to build and maintain.

SILT IN ★ ★ RESERVOIRS

IN THE article "Soil or Sediment" in this issue, Mr. Collins lays merited stress on the likelihood that silt may impair or destroy the value of any reservoir whose watershed is subject to erosion. This is no new discovery, as is evident from the few examples of ancient date cited by the author, and a host of others that will be recalled by anyone whose interest in the subject has led to reading, or who can refer to a background of personal experience. Our Mississippi, which now reaches the Gulf of Mexico through a delta of its own building that is larger than several of our States, is the best example in this country. It is also pointed out that the problem of silting, while not new, is becoming more and more serious under the modern stress of intense agriculture, with its corollary, overgrazing.

It is noteworthy that most of the cited examples of damage by silting in the United States concern the past few decades. These, of course, afford concrete examples of measurable damage. Immediately the thought occurs: What about the vast projects now in progress? Except for a few lines on Boulder Dam, none of these are mentioned by Mr. Collins.

It is interesting, however, to observe that the report of the National Resources Committee on Drainage Basin Problems and Programs, published in December, 1936, refers specifically (p. 85) to the silting problem of the Boulder Dam development. In this source book we read:



THE DESTROYING HAND

"The silt problem continues to be one of the more serious problems of the basin. The Colorado River has carried annually 200 million tons of sediment to the Gulf, and every reservoir built upon the system will be slowly robbed of its storage space unless remedial measures are applied. The cost of handling silt in the lower irrigation projects has run into millions of dollars each year; from this cost, however, Lake Mead will afford material relief. The Colorado Basin affords an excellent opportunity for an exhaustive study of the silt problem in all of its phases. Such a study should extend over a period of years and should be carried on under cooperative arrangements made by the various Federal and State agencies concerned with the problem. The findings of the investigation would be of great value, not (Continued on page 187)

A CENTURY OF SUGAR PINE

By

WILLIAM G. SCHULZ

National Park Service Photographs

"... THE MASSIVE, SMOOTH TRUNKS, GENTLY TAPERING, AND COVERED WITH A REDDISH-BROWN BARK, USUALLY SCALY, OFTEN WITH A DEEP PURPLISH TINGE. THE TALLEST OF THESE WILL REAR AS HIGH AS TWO HUNDRED AND FIFTY FEET."

ONE hundred and eleven years ago, on the headwaters of the Umpqua River in southern Oregon, David Douglas, the adventurous young Scottish botanist, discovered a giant new species of tree which later proved to be the largest and in some respects the most strikingly beautiful of the world's

pinus—the sugar pine. The dramatic circumstances of this discovery we shall presently read in Douglas's own words, taken from his journal. Meanwhile, let us pause to note that sugar pine is the tree that played the leading rôle in our most recent National Park addition. This tree attracted nation-wide attention as a result of a movement urging preservation of some 8000 acres of sugar pine within Yosemite National Park. The movement centered in California, but, after arousing conservationists in every state, spread quickly to the Capital where, last spring, it was made an issue in Congress. Long and discouraging delays followed, but finally, late in the summer, the bills authorizing acquisition of the area and providing the purchase funds were passed.

Of the many poets and naturalists who have lavished praises on the forests of California, the most eloquent has been John Muir, who tells us that no lover of trees will ever forget his first meeting with the sugar pine. This is especially true if that meeting takes place in one of its few remaining unspoiled virgin forests, as in the



Yosemite region. Then the sugar pine will excite the greatest awe and admiration, for no forest giant quite so recklessly casts aside all tree conventions as do these patriarchal pines. There are other trees of extraordinary size and individuality, it is true. For example, the two great redwoods—the Sierra redwood or big-tree, *Sequoia gigantea*, and the Coast redwood, *Sequoia sempervirens*, the world's largest and tallest trees, respectively, the former the oldest known living thing. There are the far-famed Sitka spruce and Douglas fir of the Pacific Northwest, the latter sometimes taller than the sugar pine. Or the handsome western yellow pine, scarcely smaller or less grand than sugar pine, and sometimes associated with it. Yet none of these, for all their superlative grandeur and regal stature, attains that utter extravagance of form and bearing characteristic of the venerable sugar pine. Yet, oddly enough, the sugar pine in youth could not be improved upon for general shapeliness, balance and symmetry. It is not until it attains an age somewhere around eighty to one hundred years that *Pinus lambertiana*

turns tree rebel in its long stretch for the forest roof.

When one enters a forest of old-growth sugar pine, the eye will be caught first by the massive, smooth trunks, gently tapering, and covered with a reddish-brown bark, usually scaly, often with a deep purplish tinge. The tallest of these will rear as high as 250 feet, and most of them will be six or eight feet through at the base, a few ten or twelve feet. But never is there any base flaring or outswelling as, for instance, in old oaks or Sitka spruces or western red cedars. Now let the eye sweep slowly up this magnificent, clean-cut shaft, free from branches anywhere from one hundred to almost two hundred feet—we shall have to stand back a good distance for this—and there, surmounting the whole at a dizzy height, will be a



"... A SMALL AND SURPRISINGLY IRREGULAR CROWN, LIKE A MASSIVE SHOCK OF HAIR IN DISARRAY"

small and surprisingly irregular crown, like a massive shock of hair in disarray. No two branches will be of the same length; no two placed with any attempt at order or symmetry or evenness of whorling. Most of them will be short, bending more or less outward and downward. Some will be of medium length. But most arresting will be the few exceptionally long and highly irregular ones, projecting far out beyond the others like powerful arms flung wide and free, sometimes as if in greeting to the forest, often as if in challenge to the winds. At the ends of these branches, and adding a final rakish touch to the whole, dangle the long cones, often fifteen to eighteen inches in length, occasionally even measuring up to twenty-two and twenty-three inches.

But it is at dusk, when sugar pine's superb form stands silhouetted against a still luminous turquoise sky, or, again, when a full moon floods its radiance over a dark-shadowed forest, that the tree's accents are most pronounced. Then the long arms that outreach the others seem impelled by some wild, elemental thrust for freedom, suggestive of the gestures made by certain free-expression dancers.

Sugar pine never occurs in pure stands, although in optimum zones, as in the Yosemite region, it may comprise sixty or seventy percent of the forest, even eighty percent in certain areas. It grows almost exclusively in California, although it extends over the line into a few counties in southern Oregon. A scattering of trees is also reported growing on Mount San Pedro Martir in northern Mexico, below the 10,000 foot level, according to Dr. Willis L. Jepson of the University of California, noted botanist and author of *The Silva of California*.

In California it is distributed principally along the western slopes of the Sierra Nevada, with a scattering in the Coast Ranges and in the higher mountains of southern California. In the central and northern Sierra Nevada its general elevation is from 4500 to 7500 feet, though in the extreme south it rarely occurs below 8000 feet, while in the extreme north it comes down to 2200 feet.

Sugar pine forests, like those of the sequoia just mentioned, are always open and free, and the trees wide-spaced, thus affording each an opportunity for full, unobstructed display of its immense proportions and noble features.

Hence in summer and in autumn the sugar pine forest is at the height of its glory, wonderfully spacious and sun-flooded, the towering shafts decorated with clumps of yellow-green lichen, the lower crown branches draped with long beards of it, while the fragrant, cone-strewn forest floor supports a riotous tangle of chaparral and gorgeous wild flower gardens. Squirrels, chipmunks, deer and multitudes of birds dwell there. Occasionally cold, clear trout streams come tumbling down from the snow-fields high above to sing merrily through these forests, their banks fringed with pale pink and white azaleas.

As one wanders alone in the deep peace and serenity of such groves, the imposing, clean-cut trunks seem no longer to belong to trees, but take on the appearance of superbly chiseled columns, until presently imagination shapes them into massive temples like those of ancient Egypt.

But why the name "sugar pine"? Look at any tree wounded by axe or fire or falling limbs, then taste the crystalline, sugary beads that have collected, and one has the answer. Deliciously sweet as this sugary exudation is, however, it is too laxative to be eaten in any quantity.

For the beginning of the interesting history of the sugar pine we turn back to the year 1825, when David Douglas, a young botanist and gardener at the horticultural gardens of Glasgow, arrived on the Pacific Coast. He was then twenty-seven. He had left Scotland in 1823 to come to America, but did not reach the Pacific Coast until 1825. He came as a collector for the Royal Horticultural So-

ciety of London, in whose service he remained until his untimely and tragic death in 1834. He made his headquarters at Fort Vancouver, the Hudson's Bay Post on the Columbia River, eight miles north of the present city of Portland, Oregon, and from there made numerous botanizing excursions into the surrounding country.

He excited the especial curiosity of the Indians, who were completely puzzled at first to find a white man who did not come to trap or trade in furs. But when they came to understand that the abundant plant and tree life of this vast northwestern wilderness was his major interest, they called him "the man of grass."

Douglas's first clue that a species of pine then unknown grew somewhere on the Pacific Coast came when he chanced to see some seeds in an Indian's tobacco pouch. Inquiry revealed that the pine from which they came grew far south of the Columbia River. Douglas was determined to find it; but it was not until the fall of the following year that he was able to go in search of it. Pushing southward from Fort Vancouver and crossing the Columbia, he traveled up the Willamette Valley, thence continued into southern Oregon to the headwaters of the Umpqua River. Here let us take up the narrative in his own words, quoting from his journal:

October 26, 1826. Weather dull. Cold and cloudy. When my friends in England are made acquainted with my travels, I fear they will think I have told them nothing but my miseries. . . . I quitted my camp early in the morning to survey the neighboring country, leaving my guide to take charge of the horses until my return in the evening. About an hour's walk from camp I met an Indian, who on perceiving me instantly strung his bow, placed on his left arm a sleeve of raccoon skin and stood on the defensive. Being quite sure that conduct was prompted by fear and not by hostile intentions, the poor fellow having probably never seen such as myself before, I laid my gun at my feet on the ground and waved my hand for him to come to me, which he did slowly and with great caution. I then made him place his bow and quiver of arrows beside my gun, and striking a light gave him a smoke out of my own pipe and a present of a few beads. With my pencil I made a rough sketch of the cone and pine tree which I wanted to obtain, and drew his attention to it, when he instantly pointed with his hand to the hills fifteen or twenty miles distant toward the south; and when I expressed my intention of going thither, cheerfully set out to accompany me.

At midday I reached my long-wished-for pines, and lost no time in examining them and endeavoring to collect specimens and seeds. New and strange things seldom fail to make strong impressions, and are therefore frequently overrated; so that, lest I should never see my friends in England to inform them verbally of this most beautiful and immensely grand tree, I shall here state the dimensions of the largest I could find among several that had been blown down by the wind. At 3 feet from the ground its circumference is 57 feet 9 inches; at 134 feet, 17 feet 5 inches; the extreme length 245 feet. . . . As it was impossible either to climb the tree or hew it down, I endeavored to knock off the cones by firing at them with ball, when the report of my gun brought eight Indians, all of them painted with red earth, armed with bows, arrows, bone-tipped spears, and flint-knives. They appeared anything but friendly.

I explained to them what I wanted, and they seemed satisfied and sat down to smoke; but presently I saw one of them string his bow, and another sharpen his knife with a pair of wooden pincers and suspend it on the wrist of his right hand. Further testimony of their intentions was unnecessary. To save myself by flight was impossible, so without hesitation I stepped back about five paces, cocked my gun, drew one of the pistols out of my belt, and holding it in my left hand and the gun in my right, showed myself determined to fight for my life. As much as possible I endeavored to preserve my coolness, and thus we stood

looking at one another without making any movement or uttering a word for perhaps ten minutes, when one at last, who seemed to be the leader, gave a sign that they wished for some tobacco; this I signified they should have if they fetched a quantity of cones. They went off immediately in search of them, and no sooner were they all out of sight than I picked up my three cones and some twigs of the trees and made the quickest possible retreat, hurrying back to the camp, which I reached before dusk. . . .

I now write lying on the grass with my gun cocked beside me, and penning these lines by the light of my Columbian candle, namely, an ignited piece of rosin-wood.

One wonders what impression all this made on the distinguished Dr. Aylmer Bourke Lambert of London, a founder of the Linnaean Society there and author of a treatise on pines, in whose honor Douglas named the tree *Pinus lambertiana*.



"... SUGAR PINE IS THE TREE THAT PLAYED THE LEADING ROLE IN OUR MOST RECENT NATIONAL PARK ACQUISITION"

Although Douglas was only thirty-six when, eight years after his discovery of the sugar pine, he lost his life in the Sandwich Islands, his name is immortalized today throughout the Pacific West. Most notable and fitting as a monument to him is the magnificent Douglas fir, long classified as *Pseudotsuga douglasii*, but today given preferably the species name *taxifolia*. Curiously enough, it is not a true fir, but, to translate its scientific name, "a false hemlock with a yew-like leaf."

It is interesting to speculate as to what is likely to be the next stage in the history of the sugar pine. Can the U. S. Forest Service, with its highly developed forestry technique, "bring it back"? Reforestation is still an ex-

pensive and tedious process, and the areas thus far reforested in the West are insignificant in comparison to the multi-millions of acres laid waste. Modern forestry methods have accomplished brilliant results—but trees anywhere from 300 up to 700 and 800 years of age like the sugar pines, and demanding such highly specialized conditions of light, soil, moisture and elevation, cannot be reproduced in just a few human generations, even in an optimum zone. And when we consider that on millions of logged-off acres natural forest conditions have either been greatly upset or totally destroyed, it is doubtful if they will ever again support the glorious forests

that once flourished there, vast, pristine and unspoiled. Where a forest stands undisturbed, such conditions as ground moisture and stream flow, vegetable mould and topsoil, and the naturally maintained balance between young, middle-age and old-growth trees, are self-perpetuated indefinitely.

What war is to a nation, destructive logging is to a forest.

But tragic as this picture is, the situation is far from hopeless. America is at last becoming conservation minded. And the fight for the Yosemite sugar pines has proved a powerful circumstance in arousing this awakening.

Nature's Cathedral

By ISABEL LEIGHTON HULL

When my mind grows tired of the worry and care
That clamors through the work-a-day world, everywhere,
When my soul is weary and ill unto death
Of earth's crowded places, and gasping for breath,
Then I flee from the city's discordant noise
Its glaring lights, its mirage of joys,
To Nature's Cathedral, deep in forest domains
Where the Spirit of Peace forever reigns.
There, before the altar of soft, green sod

I kneel, in reverence, to Nature's God.
In every green shrub is a sermon read,
And the lilting choir of birds overhead
In a chorus of worshipful praise is blent
To the murmuring brook's accompaniment.
Flower censers, wrought in exquisite beauty rare
With perfumed incense, fill the air.
While through the cathedral's odorous pine-tree walls
The setting sun, like a benediction, falls.

KAPOK TREE

By HUGO H. SCHRODER

SOUTH Florida presents many usual tropical fruits, flowers and trees for the visitor from the northland. Plant importations from tropical and sub-tropical regions find the climate to their liking and many of the exotic growths flourish amid their new surroundings. Trees from Australia or Madagascar may be seen growing beside those from Java, or among native Florida species.

One of these tropical tree immigrants bears a name with which many persons are familiar because of the silky floss found in its seed pods. This is the kapok or silk cotton tree, *Ceiba pentandra*, the producer of the kapok of commerce.

Kapok trees grow to great size, frequently reaching a height of 100 feet, and they often have a buttressed base twenty feet or more across. The horizontal, wide-reaching branches are in whorls, almost at right angles to the trunk.

Kapok leaves are compound, with from five to nine leaflets, and grow up to six inches in length. The flowers are profuse, as well as being attractive in appearance. Some two months after blooming the kapok fruits ripen; these contain seeds surrounded by a silky floss. This silk-cotton kapok is extensively used for stuffing cushions,



it is utilized in life buoys, and in the native home of the tree it is used for bedding and pillows. The fibre is not suitable for being spun into threads, however.

In India the flower buds are eaten and the leaves are used for fodder. A fibre used for cordage comes from the inner bark, but the wood is too soft for exterior use. In Florida, the kapok is planted as an ornamental, being an unusual type, and one most attractive in its flowering.

Things to Think About

Restoration of bounty payments on great horned owls has been announced by the Pennsylvania Game Commission on the ground that they are "vermin". We are surprised that the Commission has invoked the bounty system that has been proved so grossly wasteful of public money. Also this step seems idiotic because the great horned owl is not protected, and any farmer or game farm superintendent can legally shoot owls nesting in the vicinity and known to be preying upon wild or domestic fowl. Thus there is no reason for a bounty-inspired drive against all the owls of this species in the State. Commenting on this bounty, the Emergency Conservation Committee makes the following pertinent observation:

Predators play a vital part in the machinery of Nature. They eliminate the weak and sickly, keeping the breeding stock of the birds they prey on healthy and strong. They prevent plagues of rats and grasshoppers; in fact, the supply of predatory birds is barely large enough to hold in check some of man's greatest enemies. It is bad economics to decrease the supply of predators.

It is impossible to determine what influence is behind this move to slaughter great horned owls. It may be honest ignorance, which one must deplore, but not condemn. It may be a move to create a job or two for political reasons. It may be a concession to people who want to hunt out of season. Whatever the cause, the people who disapprove this action are more numerous, if unfortunately not so loudly articulate, than those supporting it.

In announcing his finding in favor of the Colorado-Big Thompson project to divert water under and through Rocky Mountain National Park, Secretary of the Interior Ickes states that "the finding is not a matter of choice—it is mandatory." He is, of course, correct, in view of the stipulation for such a project when the Park was accepted. The strong protest of those opposing exploitation of a National Park—a protest in which the American Nature Association actively joined—served, however, both to obtain several concessions for the future of the Park, and to serve notice on those with exploitation ideas in mind that defenders of the Parks are strong and numerous.

During the past three years reforestation plantings have been made on 502,000 acres of National Forest land. More than 145 million trees were planted on National Forests in thirty States during the calendar year of 1937. The plantings were largely made on areas that have been cut over and burned over to a point where natural regeneration is impossible.

During the last three months of 1937 agents of the Bureau of Biological Survey destroyed nearly five hundred duck traps in and along duck waters in Maryland and Virginia. Most of the ducks thus illegally caught in this region are sold to "duck bootleggers" serving eastern

cities. The traps were capable of catching forty to fifty ducks in one night, corn bait being used for lure.

Indicative of a growing trend is the action of the Rome, Ohio, high school in giving regular credit for units of study in forestry, water control, erosion control, soil fertility, wildlife restoration and state parks. School Superintendent Ralph L. Wilkerson announces this program with the approval of the State Department of Education. He states that practical field work and study will be conducted.

Soil conservation and wildlife management go hand in hand, according to a new Department of Agriculture Farmers' Bulletin entitled *Wildlife Conservation through Erosion Control in the Piedmont*. This Bulletin is number 1788, and is popularly written. Copies are available from the Office of Information, U. S. Department of Agriculture, Washington, D. C.

Designation of large roadless wilderness areas on Indian Reservations has been ordered by John Collier, Commissioner of Indian Affairs, with the approval of Secretary Ickes. Under the definition of the National Resources Board, a roadless area is one that contains no provision for motorized transportation and comprises at least 100,000 acres in forested country and 500,000 acres in non-forested country. Twelve such areas have been set aside on the reservations. These range in size from 1,590,000 acres, inclusive of Rainbow Bridge, on the Navajo Reservation, to 105,000 on the Warm Springs Reservation. Each area has been named. Mr. Collier's remarks, in issuing this order, set forth an important philosophy of the wilderness. He says:

Mechanization is growing in America with unprecedented acceleration. Activity after activity which for countless generations have been performed directly by man power and area after area which have been subject only to the forces of nature are now dominated by machinery. To millions of Americans this constitutes an unmitigated blessing.

There are other millions who, while they appreciate the good which the machine brings, also have an intense craving for another type of existence. They do not see why their life must be lived entirely in the world of machinery when there is ample space in this great country for another world as well. They can not believe that with vast stretches which need not be used for the mechanical activities of our civilization, it is necessary to make every nook and corner of the country a part of the machine world and to wipe out all sizeable traces of the primitive.

It is perfectly feasible to reserve for such people something of those wilderness values which they crave. A little advance planning and a little balancing of the claims of genuine conflicting values will make it possible to save many areas from mechanization. In the past a great many ideal wilderness areas

have been opened by roads which were of no necessity and which have never returned in value of service anywhere near the investment which has been put into them. Had there been a little prior thought about a reasonable balance between primitive and developed areas, these roads would not have been constructed.

From the standpoint of the Indians, it is of special importance to save as many areas as possible from invasion by roads. Almost everywhere they go the Indians encounter the competition and disturbances of the white race. Most of them desire some place which is all their own. If, on reservations where the Indians desire privacy, sizeable areas are uninvaded by roads, then it will be possible for the Indians of these tribes to maintain a retreat where they may escape from constant contact with white men.

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Conservation has been selected as a 1938 project by the Camp Fire Girls, and the January issue of *The Guardian*, publication for leaders, devotes most of its space to suggestive material on the subject. Conservation is defined in an article by Dr. E. Laurence Palmer of Cornell, Director of Nature Education of the American Nature Association. Helpful references are made to informative source material, and advice is given on practical projects.

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Due to a combination of circumstances, including unrestricted killing by irresponsible gunners, persecution because of misinformation regarding the true economic status of the bird, and heavy storms during the nesting season, the brown pelican is facing extinction along the Texas Gulf Coast. This warning comes from the Texas Federation of Nature Clubs, which has issued a factual bulletin on the habits of the pelican and the alarming situation that it faces. Since the species is now unprotected by law in Texas, the Federation is campaigning for protection of a bird that lives almost exclusively on non-

edible surface fish, and hence is not harmful economically. In fact, its friendliness, interesting character, and peculiar habits make it a source of attraction to visitors.

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"If sportsmen are to continue to enjoy good hunting from year to year they must contribute more than the \$2.00 the law requires them to pay for a hunting license—they must contribute their time, money and effort to the end that the wild creatures they like to hunt are able to pull through the winter."

With this statement Patrick W. Hehir, Director of the Division of Fisheries and Game of Massachusetts, introduces some pertinent remarks concerning the problem of maintaining wildlife resources. He goes on to say: "The man who lives only for the hunting season and who puts his gun away when it is over, happy in the knowledge that he had an exceptionally good time, who killed all he wanted and is willing to 'call it a day'—does he contribute to his next year's sport? Seldom." Mr. Hehir points out that "the day is fast approaching when wildlife will require every effort on everybody's part in order to sustain itself—not only during the winter but at all times." Referring to Massachusetts, he says that "with over seventy-five thousand hunters going afield each year and the number constantly growing, with good roads and high-powered automobiles linking hunters with remote sections; with civilization constantly growing; the problem of protecting, feeding and perpetuating wildlife is becoming an enormous one."

Mr. Hehir is right, sportsmen are going to have to contribute more than the present license fees, which are everywhere an infinitesimally meager payment for what they destroy.

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MR. ICKES ON SCENIC ROADS

To a hearing before Secretary of the Interior Ickes came a delegation of Minnesota Congressmen, representatives of the State and some Indians from the Chippewa Reservation on the shore of Lake Superior opposite Isle Royale. They sought road rights through the reservation so that a highway that runs along the shore of the lake for one hundred and thirty miles would not have to turn inland when it reached the boundary of the reservation. In opposition appeared the Indian Office and the Quetico-Superior Council. Mr. Ickes ruled against the highway. In so doing he made some worthwhile and pertinent observations that we applaud as we quote:

Many people's idea of a scenic route, seems to be the engineering features of the road. They would like to see how steep a mountain an automobile can travel within a given time. The scenery is really marred in a great many cases by our so-called scenic routes.

So far as the Indians are concerned, I am frank to say that I take with a very large grain of salt the apparent unanimity with which the Indians they have brought here to this hearing are

said to be in favor of this road. It would not be the first time (and I hope that you Indians who are here will take this word back to the members of your tribe) that Indians have been over-persuaded to assume an economic benefit from some so-called improvement and have lived to regret it. It would not be the first time that Indians have given up their lands, given up their rights, given up their privileges, and then had to come to the Indian Office to be bailed out. That has been common history in this country from the very beginning; if the white man sees any property he wants belonging to the Indian, he seems to think he can take it as a matter of right. * * *

In many parts of the country we are building too many roads and we are destroying the wilderness areas. We are marring scenery in the name of scenic routes and for the so-called purpose of conservation. I cannot see that a single argument has been advanced that would sustain this project from the conservation point of view. I don't think you are helping scenery. I think you are destroying it. * * * Perhaps somebody told you I was interested in conservation; that may be why the word has been misused so often this afternoon. * * *

We are making a great mistake in this generation. We are just repeating the mistake in a different form that our forefathers have made. Instead of keeping areas which will attract people, which will add to the wealth and health and comfort and well-being of the people, if we see anything that looks attractive we want to open speedways through it so that people can enjoy the scenery at sixty miles an hour.

FIGHTING FOR THE ELM

If the battle against the Dutch elm disease is to be won adequate funds are needed to carry on the campaign

By DON BLOCH

DISCOVERY of new infections of Dutch elm diseased trees in recently quarantined sectors in New Jersey, New York, and Connecticut has caused the total work area to increase to 8200 square miles—an extension of 740 square miles over that of last preceding field reports.

Although assured by Department of Agriculture officials that this additional salient in the country's continuing campaign against the elm menace is in line with past natural progression of spread, and is no cause for panic, (since the principal region of infection is still restricted to the area within a forty-mile radius of New York Harbor) the information nevertheless serves to focus attention upon this one disquieting fact: *no elm anywhere in the United States is immune to the disease.* As long as any trace of the fungus remains in this country, our elm trees are faced constantly with the threat of extinction, a fate already set upon the elms of Europe.

The principle of eradication, as the only possible control of the spread of the disease, is firmly established as the federal and cooperating states' objective in the campaign. Diseased, dying elms, and even those trees chiefly of no esthetic or commercial value that may appear healthy but are potential havens for the chief carrying beetle, *Scolytus multistriatus*, and that stand in regions contiguous to present regulated areas, must be felled and burned.

The agriculture departments in each of the three states have revived existing local plant-pest-control laws, or adopted new ones, to enable Federal eradication work to go forward smoothly. Aggressive eradication, research and scouting units, now firmly established, need only assurance of adequate and continuing funds to be kept alive so that they may discharge their obligations.

Statistics of the last five years indicate that the program to date has been effective. Although 6135 diseased cases were found in 1937, there has been a progressive reduction in the number of known infected trees—1562 fewer cases last year, for example, than in 1936. There has been no reappearance of infection in Maryland and Virginia where trees were felled and burned the year before. Since 1934, when the first regular appropriations got the program under way, a total of 27,973 elms infected with the disease have been found and destroyed. All together, almost 4,000,000 trees have been removed in clear cutting, sanitation and eradication activities. The sum of



AMERICAN ELM, A TREE OF BEAUTY

Unless the fight is won to eradicate the fungus disease that kills them, no elm in America is safe

\$12,000,000 expended in connection with this work over the country is justified in the light of the Department of Agriculture's figures, which estimate the value of the ornamental and shade tree elms growing on homesites, along streets and roadsides. On the basis of an average value of \$26 a tree, says the Department, \$662,000,000 would be a nominal estimate of what their owners think the trees are worth.

Cooperating officials of the tri-state infected area have worked out an estimate of federal funds necessary to prosecute the campaign for another five years, through 1942. Based on past costs in the work area, the estimate calls for about \$15,000,000, to be spent in the proportions of forty per cent the first year, twenty-five per cent the second, then rapidly dwindling to fifteen, twelve, and eight per cent, respectively, for each year, beginning with 1938. The projected eradication program embodies these major features: for the outlying infections, prompt employment of measures to eliminate the disease by felling infected trees and burning them; for the New Jersey, New York and Connecticut areas (1) the timely and methodical scouting for diseased and devitalized elms and their later removal and destruction, (2) the rendering harmless of trees classified as devitalized, by poisoning or silvicing them, and (3) continued creation of elm free areas—regardless of the condition of the elms therein—so that the total work area can be progressively contracted from without and reduced from within.

Trained men, who climb and examine each elm to discover its state of health, scout the area of known Dutch elm disease infection as well as suspected areas—the latter,

AUTOGYRO AID IN SCOUTING

Four of these planes are now used to detect the wilting, yellowing leaves and dying branches at the trees' tops. Much wider areas can be covered by air scouting

chiefly, in a region of 3000 square miles surrounding the "regulated" area of heaviest infection, called the protective zone. Trees showing wilted foliage and discoloration of the wood are tagged and quarantined. However, since at least four other funguses are known to cause similar symptoms in elms, laboratory culture and diagnosis is the only reliable course to follow in determining presence or absence of the disease. Samples of the trees thus quarantined, therefore, are sent to the Federal Dutch Elm Disease Laboratory at Morristown, New Jersey, for cultural analysis. If the sample there yields the Dutch elm disease fungus, the tree is legally condemned for destruction. It is then cut down, the wood and brush are burned over the stump, and the stump itself is treated with copper sulphate to prevent its sprouting.

Those elms having a sentimental or esthetic value are usually located where either scouting and tagging or later felling is easy. Those of no ornamental or commercial value, however, are generally found in swamp areas or on mountain ranges where scouting and cutting, in certain seasons, becomes hazardous and costly. So heavy has this latter phase of the work become that in some areas a process of silvicide—whereby, with certain chemicals, the tree's danger as a beetle haven is practically nullified—is the resort. The remains of the tree left standing are given over to the owner to dispose of as he wishes.

Further to reduce eradication costs, by increasing the speed of the work both in cutting out infected trees and scouting to find them, two new equipment factors have been introduced into the work areas. One is a power saw outfit mounted so that it can be taken to relatively rough or inaccessible places. With it, ten men can cut down and make ready to burn a tree twenty-one inches in diameter at breast height, in twenty-one minutes. A second factor has been the use of four autogyro planes for scouting.

One observer, travelling in an autogyro, scouted 12,000 miles along railroad rights of way over which the original imported elm-burl logs that brought the infection from abroad had been hauled inland to be made into veneer at various factories. A follow-up ground crew visited points marked on this observer's map while he was in the air. The other three gyros carried scouts, hovering close above the tree tops, over inaccessible regions in and around the centers of infection.

All scouting becomes increasingly difficult as the campaign progresses. The men on this work must watch more closely for evidences of the disease and cover more inaccessible locations. This past year scouts were under orders to sample all elms showing any indications of ab-



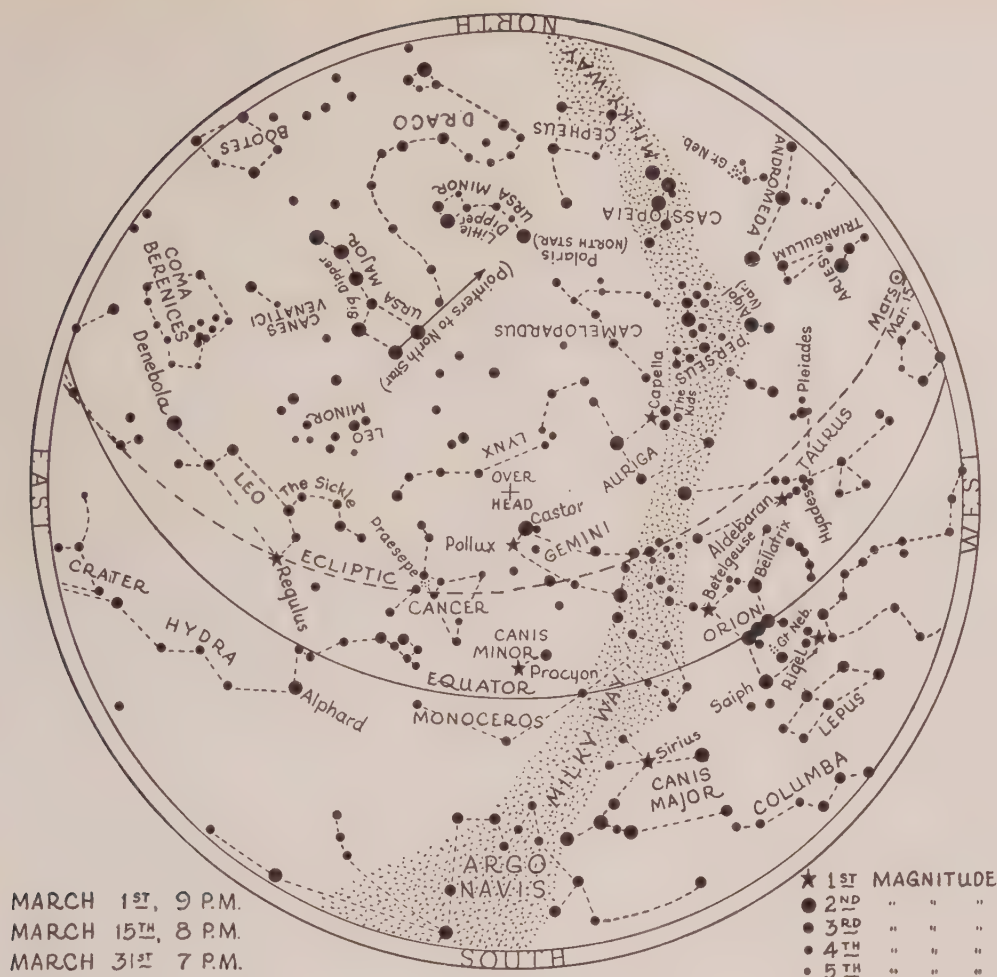
normality. This necessitated more tree climbing than was formerly done, but greatly reduced the chance of overlooking infections. Twig samples from more than 80,000 suspicious elms were gathered and forwarded to the culture laboratory.

Winter eradication activities in the tri-state area centered on the removal of dead and devitalized elms, not necessarily Dutch elm diseased, but those which provide breeding places for the beetles that spread the fungus from infected to healthy trees. Where summer scouting and eradication are especially hazardous and difficult, all elms were removed from many areas of heavy infection and certain swamp and mountain regions. This "clear cutting" of elms removes those areas from any future rescouting, besides making it impossible for the fungus to persist, or for insect carriers of it to survive there.

In New York, especially, state authorities have so conducted their campaign that community and even private citizen "scouting" to report suspicious elms, or possible new insect carriers, is a regular part of the general fight against the disease. Eradication has been thoroughly "sold" to the people of that state. Of course, a tree once infected with Dutch elm disease is beyond hope of saving. However, although there is not complete agreement among the pathologists on this point, all concede that spread of the disease is at least not so rapid where healthy elm trees predominate.

Accordingly, the best method of protection for the owner is to prevent infection. Let him follow this simple rule of sanitation: quickly destroy all dead elms, and promptly prune out all dead or sickly wood where the disease-carrying insects may seek food or find places to lay eggs. In any case, he should seek advice from competent arborists or tree specialists, or consult his State Forester or Extension Forester.

And, as a good neighbor and helpful citizen, he should acquaint members of Congress and responsible state officers with this threat to America's elms, urging continuance of funds to wage the fight being conducted by the Federal and State Governments to wipe out the Dutch elm disease. The price of neglect is too much to pay.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

THE RESTLESS SUN

By ISABEL M. LEWIS

IN THE year just past the sun attained a high peak of activity, as evidenced by the appearance of spectacular sunspot groups in February and July. These were among the largest ever recorded. There were, also, brilliant prominences on the sun, great in number and intensity, including a record-breaker in height and velocity photographed on motion-picture film in September at the McMath-Hulburt Observatory. It seems possible that the sunspot maximum may have already occurred, although it is not expected before next year. Not until the sun's behavior for this year and next has been observed from day to day, and his "spottedness" and other evidences of internal disturbances have been recorded, will it be known just when this period of greatest disturbance was reached.

Not a day passed in 1937 without the appearance of at least some spottedness on the face of the sun. According to the records made at the Mount Wilson Observatory the sun was extremely active in the months of July and August, and more quiet in September and October. This

does not mean, however, that the maximum had been reached, for solar activity fluctuates, and frequently drops off markedly between periods of intense activity. The mean number of sunspot groups observed daily in July, 1937, at Mount Wilson was 13.6, which was stated to be the highest monthly average in the history of that observatory; and the record for August, which was 12, equals the record established in February. On July 11 and 13 there were 23 groups of sunspots visible on the sun. This, it was stated, exceeded the number observed on any day since solar observations were begun there in August, 1905. In September the daily mean number dropped off to 9.1, but it had increased to 10 in October. Later observations indicate that the sun is still extremely active, and it is unlikely that the period of its maximum disturbance for this cycle has yet been passed.

The great sunspot group that crossed the central meridian of the sun on July 28 was one of the largest ever observed. It was 175,000 miles long and covered an area

of 3600 million square miles. It would take twenty-two earths in a row to equal it in length! Our planet would be but a speck in the center of this great solar storm. It passed so far north of the center of the sun as it crossed the solar meridian that the streams of electrified particles that were undoubtedly ejected from it, as they are from all sunspot areas, did not come in line with the earth at that time. No magnetic storms in the earth's atmosphere occurred then, although a magnetic storm of moderate intensity came on August 22, when this group was three days east of the meridian on its return after being carried around by the sun's rotation. This group was surpassed in size by the great group of January 24, 1926, and nearly, if not quite, equalled by the group of February 9, 1917. Other great sunspot groups exceeding 3000 million miles in area were those of February 11, 1892; February 4, 1905; August 10, 1917, and February 1, 1937. None of these were as large in area as the great sunspot group of last July.

Sunspot groups with an area of 1000 million miles can be seen with the naked eye without the aid of a telescope, and are classed as large. Dr. R. S. Richardson of the Mount Wilson Observatory in an article on "The Largest Sunspot Groups of Modern Times," in the Publications of The Astronomical Society of the Pacific, states that, during 56 years of observation at the Greenwich Observatory, 11,613 sunspot groups were recorded, and that of this number 198 have had an area between 1000 and 2000 (in millionths of the sun's visible hemisphere); 23 have been between 2000 and 3000, and only five, including the group of February 1937, but not that of July 1937, had an area in excess of 3000. The maximum spotted area, which was that of January 24, 1926, was about 5000. Sunspot areas appear darker than the surrounding photosphere because the temperature in these regions is about 1000 degrees lower than the normal surface of the sun. So small, however, is the aggregate area of spottedness of the sun, even at its greatest extent, as compared to its total area, that the effect of sunspots on the radiation of the sun is quite negligible.

Sunspots are not the only sign of great solar activity. The chromosphere, which is the dense, lower atmosphere of the sun, is filled with the gases of all solar elements. In color it is decidedly reddish, due to the predominance in it of the scarlet flames of hydrogen gas. Always in a state of seething, restless motion, its activity is greatly increased during sunspot maximum periods. The intensely brilliant patches known as flocculi are always most prevalent in sunspot areas, although they may appear anywhere on the solar surface. They are the seat of the great chromospheric eruptions that with startling rapidity, often at intervals of a few minutes, rise to heights of thousands of miles above the chromosphere. Often they appear almost simultaneously in widely separated sunspot areas, as if they originated in some deep-seated solar disturbance. The radio fadeout is one of the effects of these eruptions transmitted evidently with the velocity of light, and often they are followed, after an interval of about 26 hours, by magnetic storms. When seen at the disk of the sun in

profile they are the familiar solar prominences, visible during total solar eclipses, or at other times with the aid of the spectroheliograph. They may assume many strange skeleton-like forms or resemble fountain-like sprays or brushes of brilliant color—red, pinkish, or even yellowish-white—but consist most frequently of scarlet flames of incandescent hydrogen or calcium, although eruptions of other solar gases, such as helium or sodium, also occur. Unlike the other type of solar prominence, known as the quiescent type, which may last with little change in form for hours or even days at a time, these eruptions rise to great heights and change in form in a few minutes.

The depth of the chromosphere is about 6000 miles and most solar prominences do not reach a height above it greater than about 20,000 miles. Only rarely do they attain heights greater than 100,000 miles. Dr. C. G. Abbot recorded observing three or four that exceeded 150,000 miles in height, and Secchi one that attained an altitude of 300,000 miles. Until last year the record for height attained by chromospheric eruptions was held by a prominence that was observed on November 19, 1928, which reached an altitude of about 580,000 miles. The diameter of the sun itself is 864,000 miles. The great sunspot group that crossed the sun's central meridian on July 28, 1937, had in, or near it, between July 24 and August 2, thirteen bright, chromospheric eruptions visible at the Mount Wilson Observatory, six of which appeared on July 25.

At the McMath-Hulburt Observatory at Lake Angelus, Michigan, great prominences were observed at each return of this great group to the edge of the solar disk. In all it crossed the sun's central meridian four times before it disappeared. On September 17, at that observatory, a record-breaking prominence for height and velocity was seen to develop and pass finally out of the frame of the motion-picture camera with which the observations were recorded, at a height of about a solar diameter of 864,000 miles, within a period of 103 minutes. One portion of the rising mass became detached and moved upward with a velocity that was measured by projection. It moved with uniform motion increasing in speed at intervals until it reached a velocity of 455 miles per second and receded into the corona. This velocity is greater than the velocity of escape from the sun, which is 385 miles per second. The greatest known velocity of a solar prominence prior to this was for a sunspot-type prominence, similar to this one, observed at Mount Wilson over a spot group on January 12, 1926, with a velocity of 328 miles per second.

When one considers the record-breaking activity of the sun last year, both in number of sunspots and height and velocity of eruptions, it is evident that, unless the sunspot maximum has been reached for this cycle, great activity must be expected in the present year.

On March 21 at 1:43 A.M., E. T., the sun will cross the equator coming north, and spring will begin. Mercury will be in fine position for observation in the west the last week in March. Venus is low in the west at sunset. Jupiter is poorly placed in the morning sky, and Saturn is in conjunction with the sun on the 29th. Mars sets this month about three hours after the sun.

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TEN THOUSAND BATS

(Continued from page 151)

and a black face. Its forearm is smaller than in other species of *Myotis*. This bat is rare.

Most of the details of the winter homes of New England's migratory bats remain to be solved. It is believed that some of the tree bats fly as far as Bermuda. Banding, if carried on extensively, will probably clear up many of these mysteries. Mr. Griffin thinks so and is spending his spare time, winter and summer, in banding as many as possible over a wide area, so that the chances of identification of migratory or wintering bats will be greater. Many problems of the mating habits of bats also remain to be solved. It is believed by some scientists that they mate in spring, but others think that they may mate in fall, and that the processes of conception and development are delayed during hibernation and resumed in spring.

Mr. Griffin is also seeking the winter resorts of bats that are found in summer in non-cave country and he believes that, to some extent, there are short migrations from some parts of New England to others, such as from the granite hills of New Hampshire to the limestone mountains of Vermont.

A complete and detailed description of Mr. Griffin's bat studies is to appear in a book, "*Underground New England*," a popular study of the caves, mines and other subterranean retreats, by the author of this article, to be published by Stephen Daye Press, Brattleboro, Vermont, early in 1938. Photographs by Palme.

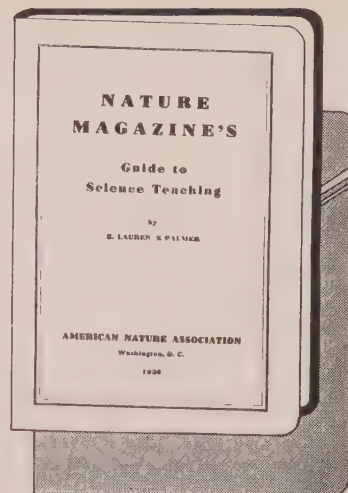
For the scientific aspects of bat banding any interested readers are referred to original articles by Mr. Griffin in the *Journal of Mammalogy*, Vol. 15, No. 3, August, 1934; Vol. 17, No. 3, August, 1936.

Wildlife Increases in Smokies

Wild turkeys have increased approximately 300 per cent in the last five years in the Great Smoky Mountain National Park as a result of wildlife protection policies, the National Park Service reports. Ruffed grouse and quail likewise are making gains on the 400,000-acre preserve. It appears that if all the United States could be given National Park status for a few years our wildlife would regain its former abundance.

Trap Contest

The American Humane Association has announced its eleventh annual humane trap contest, to be conducted in the same manner as in previous years. The usual \$500 in prizes has been augmented by an additional \$50 donated by General Charles McC. Reeve. Everyone, everywhere, is eligible to compete, but all entries must be in the hands of the Association before April 30. Besides the Reeve special prize, to be awarded by the judges at their discretion, prizes are offered in three groups: for those traps that take animals without injury; for the leghold type trap (traps that hold without injury) and for traps that kill humanely. In addition, the *National Humane Review* is sent free for one year to all contestants. Entry blanks for the 1938 contest can be had from the Association at 80 Howard Street, Albany, New York.



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"I think that in general it is a very fine piece of work. It is very valuable for showing how otherwise unrelated pictures and experiences may be used for particular purposes, thus preventing the work from becoming haphazard and incidental." Dr. Victor L. Crowell.

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THE SCHOOL PAGE

★★★

SOUND ADVICE

In March, Nature begins to be vocal throughout most of the United States. True, peepers have been calling since the first of the year in the southern states but by March the wave of sound has swept through the country to the Canadian border. It is appropriate then that we see how this may be used in the school program.

Few elementary school outlines, including the New York outline about to be published, propose study of sound in the lower grades. Yet few phenomena of Nature may be demonstrated more conveniently. The ways in which sounds are produced; how they are transmitted; how they are received; the effects they produce; how they are interpreted—all suggest valuable studies ignored in most printed programs.

The seasonal sequences of sounds are worth recording. At what time of year, for example, are the frogs of one's region most vocal? When are insect sounds predominant? Are bird sounds uniformly conspicuous through the year, and what relations seem to exist between them and the time of mating, nesting, moulting and migrating? And can one generalize safely in these matters for all members of a large group of animals? In the northeastern States there seems to be a definite frog-toad sequence in which we hear the peepers first, these being followed by the tree-frogs, wood-frogs, meadow-frogs, common toads, green-frogs and bull-frogs. What is the sequence where you live? If you are unable to tell the calls of the local species set the children to the task of finding what they can about the subject.

It might be well to make a start in the study of sound by interpreting directions from which sounds are expected by animals shown in pictures in *Nature Magazine*. The ears provide excellent help in this study. Did the dog shown in Dr. Bailey's excellent article in this number anticipate sounds from in front of him or from behind him? Were the horses shown in the article on "The Story of the Horse" in this number expecting commands from in front of them, from the rear or were they indifferent to sounds? Other worthwhile picture studies along this line may be found in *Nature Magazine* in Volume XXXI, on pages 8, 41, 79, 97, 104, and also in XXX, 17, 26, 31, 41, 43, 80, 136, 200, 229, 235, 265, 329, 352 and elsewhere. Among the more useful references in earlier numbers will be those in XXV, 229-230; XXII, 7-12, 165; XX, 57; XIX, 92-94; XVIII, 92-96 and XVII, 225-228.

In making these studies of sound-receiving organs and their position the idea should be developed that some of the commoner mammals have superior ability to move their ears in any direction, while others have this restricted. In general, the plant-eating animals have this ability better developed than do the animal eaters. Why would one expect this? Plenty of illustrative examples of this may be found in the references already given and in XXVI, 91-93; XXV, 109, 307, 311; XXIV, 30; XXIII, 63-68, 163-166; XXII, 7-12, 135, 165; XIX, 223; XVIII, 92-96 and XV, 219-221.

How sounds are produced may not be so

easily shown by pictures, and if shown by pictures may be easily misinterpreted. A bull elk with its mouth open may be calling or may just have its mouth open. There are poses, however, which are not easily misinterpreted and these may and should be sought. A dog or wolf with its head pointed towards the sky and with its mouth open may usually be considered to be howling. When the sounds are produced there is also other evidence that may be found. Parts of the body are contracted to produce the sound. Other parts are swollen with air, and so the story goes. With the frogs and toads, this air reserve may be in two sacs, one on either side of the throat as with the meadow frogs, or it may be in a single sac that swells the throat into a huge balloon which one would expect to burst. Look for these things in *Nature* and in *Nature Magazine*. See Volume XV, pages 219-221 and elsewhere.

In certain parts of its range, grouse may be beginning to drum before a new issue of *Nature Magazine* is off the press. How this is done is too frequently misunderstood. The birds do not beat the logs on which they stand nor do they beat the sides of their bodies. Instead they beat the air. See Volume XI, page 314 or, better still, see a grouse in the act or a motion picture of it. Information as to where these pictures may be procured will be supplied on request.

The ways in which insects produce sounds are so varied that they should be studied wherever possible, and the same is true of how they receive sounds. Recent numbers of *Nature Magazine* have not supplied an abundance of material on this subject but an excellent article appeared in Volume XVIII, pages 92 to 96.

It is not so easy by means of pictures to detect through their poses whether birds are using their ears or their eyes to learn of what is going on in their environment. Since these sense organs in birds are rather fixed they can tell us little. With birds, the eyes can tell us more than the ears. Still one is inclined to feel that one cormorant shown on page 74 of the last issue of this magazine might have been attempting to locate something by sound. There is some danger of misinterpretation of the behavior of the "ears" of owls. What appear to be ears are generally ear-tufts, and not these, but the ears, which are usually hidden, function as sound-receiving organs.

If it is difficult to interpret the actions of birds correctly, it is even more so concerning such animals as the spiders, scorpions and their kin. The poses that these animals frequently assume make it seem that they are trying to receive some information on what is going on in the neighborhood. It would seem that they were listening. Compare the poses of the scorpion, XXXI, 94 and the fawn XXXI, 97 to notice how each seems to be seeking advice on what is happening in a given direction. It is easy to say that the fawn is using its sense of hearing to help. It is not so safe to say this of the scorpion. Look through the index at the end of each volume of *Nature Magazine* for references on spiders and scorpions. Then with the pictures before you, study this problem for what the evidence is worth. Notice how the sense of sight cen-

ters in the eyes, which are plainly visible even in the young, XXXI, 94, but the structures that resemble ears are not so evident. That these spiders hear has been frequently demonstrated. A Harvard professor who is a violinist, and is also interested in spiders, has found that he can make the spiders in his backyard do certain things when certain sounds are made on his violin. Not only has he found this out but he finds that while some spiders react to one sound, others react to another. It is possible that with these and with other animals the range of sensitivity to sound is greatly different from ours. When Mr. Brand and Dr. Kellogg were working on recording bird songs, XXIII, 163-166, they found that some bird sounds were beyond the range of the average human ear, and one can easily demonstrate how individual humans range in this respect. Almost every year I have students who are entirely unable to hear the calls of black-poll warblers even though these are easily heard by others. If we have such conspicuous variations in sensitivity to sound in individuals of our own species, is it surprising to suspect that there is even greater variation in the range of sensitivity possessed by animals only remotely related to us. In some cases, this may be to our advantage and in others it undoubtedly is not.

Do not let the suggestions on this page limit activities to studies of pictures. Learn from the living things about you what sounds they can receive. Let this go so far that you try to detect the degree to which other animals can interpret sounds made by us. How big a vocabulary can your dog really understand if he is not permitted to interpret anything you do except what he hears? Can a cat demonstrate that it is the equal of a dog in this respect; and how about a horse, a cow and so on through the list of domesticated animals? Try to make a vocabulary of your own that will be useful in understanding whether an animal is indicating by sound such emotions as pain, joy, challenge, defiance and hope. How large a vocabulary can you read into the sounds made by poultry, and how well can you imitate these sounds so that they will be properly interpreted by other humans or, better still, by the birds?

As has been the case in the past, further suggestions for developing the ideas on this page and for grade placement may be found in *Nature Magazine's* "Guide to Science Teaching." This book of 128 pages, which may be used with or without *Nature Magazine*, is now for sale postpaid at twenty-five cents instead of at the original price of one dollar.

In view of references made in this department to past issues of *Nature Magazine*, it is pertinent to point out that bound volumes of most volumes are available for library use. Also, in cases of schools that have preserved the magazines but may have gaps to fill, single copies of most issues may be obtained through the Book Department of the American Nature Association. The index covering the first ten years and twenty volumes will be found valuable for use in reference work.

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Back in the days when the words "forestry" and "foresters" were just beginning to emerge in our national vocabulary, a little book was published for the specific purpose of telling the youth of that day just what forestry was and what the profession of forestry offered. The title of the book was *The Training of a Forester*, and its author, Gifford Pinchot, was the foremost and best known forester in the United States, as well as the first forester of the U. S. Forest Service. That was in 1914.

Since that far-off day forestry has faced many changes, and what was true regarding its possibilities as a profession then has been modified in many ways. So in order to keep abreast of these changes, Gifford Pinchot has written a fourth edition.

The present edition has been entirely rewritten and re-set, and is well illustrated with photographs of forest activities taken by members of the U. S. Forest Service. Clearly written, attractively bound, and down to the minute in its information, *The Training of a Forester* should be read by every young man who, in the process of choosing a profession, has thought of the possibilities of forestry. Among the material included in the book is a detailed treatment of forest schools and their curricula, and a statement based on Mr. Pinchot's long experience as to what personal characteristics the forester needs to achieve success.

It is not an exhortation for the youth of the country to become foresters. Far from it. Mr. Pinchot is careful not to promise too much. "Forestry is a profession," he says, "in which you may fully realize the durable satisfactions of life, if you understand it, love it, pursue it with enthusiasm, and continue to study it throughout your career. It is very likely to make you happy, but it will never make you rich."

"What then can a forester expect? Hard work and happiness, and a chance to make use of the best that is in you. Good service to your fellows, but neither ease nor riches. A long, hard row to hoe in a growing, progressive, and supremely useful profession. If you are the right man, and only if you are the right man, more than a full share of the things that are worth while."

The book is published by J. B. Lippincott Company at two dollars.

Outdoor Group Elects

The Federation of Western Outdoor Clubs, at their sixth annual convention held on the slopes of Mount Tamalpais, California, have elected the following officers: president, Paul Thiess, Mount St. Helena Club, Washington; vice-president from California, William J. Murray, Sierra Club; vice-president from Oregon, Edward Newbauer, Trails Club; vice-president from Washington, Fairman B. Lee, The Mountaineers, Inc.; secretary-treasurer, Aaron Glasgow, Spokane Mountaineers, Inc.; corresponding secretary, Gertrude Boyer, Contra Costa Hills Club.

Add Correspondents

Bertha Gordon of 401 Second Street, La Salle, Illinois, is interested in flowers, trees, butterflies and moths, and would like to correspond with others similarly interested. She has a butterfly and moth collection.

The New York State College of Forestry

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Special laboratories for instruction in wood technology, in pulp and paper making, in kiln-drying and timber-treating and a portable sawmill are other features of this institution.

Applications for admission must be filled out and returned before June 15.

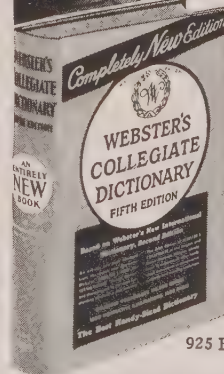
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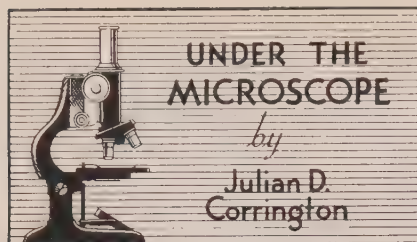
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The Work of Lenses

Thus far in our discussions we have dealt with subjects for examination under the microscope, but have said little about the instrument itself. Since the better the workman understands his tools the more he will accomplish, it would seem high time to devote some of our space for a while to learning a bit about the principles of optics—principles that underlie any intelligent use of that greatest of all instruments, the microscope.

The first need is to understand how microscopes form enlarged images, and this concerns lens construction and the laws of refraction. Microscopes are designed on paper and built by mathematics before they reach the stage of material operations on factory lathes, and this interesting process is possible because man has learned what happens to light rays as they traverse objects of different densities.

While a limited amount of mathematical jargon in these explanations is necessary, summaries in plain language will be included, so if you are not mathematically minded or lack the necessary background, read on anyway—there will be something here to interest all classes who follow these columns.

When we look at some object through the microscope, how is it that we are able to see an image? First, because we have arranged for a source of illumination—the eye is itself an optical instrument and requires light in order to work. A beam of light, as from the sun, comes in our window and we place a silvered opaque body, the mirror, at such an angle that light is *reflected* up the microscope tube to our eye. A mirror is an optical instrument—in fact the simplest one and the first to be discovered by ancient man. If the mirror is plane, the laws governing angles of reflection are simple; the entering or *incident ray* and the leaving or *reflected ray* make the same angle with the perpendicular.

Continuing its journey from the mirror to our eye, the light beam must next pass through a number of transparent or translucent materials having different densities—air, glass, balsam, sometimes the object—and in so doing is bent or *refracted* by each one in turn, the amount of bending varying with the density of the substance. Refraction, like reflection, has its laws, and to their operation optical instruments primarily owe their performance.

As an example for explanation, take the case of glass—first, a plane piece with two parallel sides, as a window pane. If a light ray strikes the glass vertically (fig. 1, A) it will pass through without deflection. However, should it strike at an angle it is bent toward the perpendicular upon entering the glass and bent again in the reverse direction when leaving (fig. 1, B). The angle of the ray is not changed, the angle of incidence being the same as the angle of emergence—the ray is displaced but not otherwise affected.

Should the piece of glass present two sur-

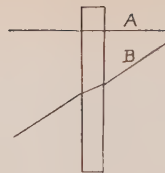


Figure 1

faces that are not parallel, as in a prism, the ray of light is bent upon entering and again on leaving, as before, but does not resume its original course (fig. 2), being refracted in a different direction. The law

is that the new direction is always toward the base of the prism, while the amount of deflection depends upon the density and the shape of the prism. Scientifically considered, refraction is a change in the *velocity* of a wave of light in passing from one transparent medium to another, and depends, as in the example above, on the relative density of the two media and on the angle at which the incident ray strikes the refracting medium—the *obliquity* of the entering ray.



Figure 2

In order to compare the refrangibility—that is, the refracting capacity—of different materials, it is necessary to set up some standard for comparison and some system of indicating differences. These requirements are met in the mathematical expression known as *refractive index*, abbreviated R.I., in the following procedure.

A vacuum, since it contains no matter, would exert no refraction and as a basis for comparison the R.I. of a vacuum is given the value 1. Consequently all substances have an R.I. greater than 1, since all substances are denser than a vacuum. Now the R.I. of air is so very low (about 1.0003) that for all practical purposes it may be assumed to be 1, and air may be taken as the standard of comparison. When a light ray passes from a rarer to a denser medium, as from air into glass, it is bent toward the perpendicular; conversely, when it passes from a denser into a rarer substance, as from glass into air, it is refracted away from the perpendicular.

The sine law of Snell and Descartes states that the sine of the angle of the incident ray, divided by the sine of the angle of the refracted ray, equals the index of refraction. This merely is the more exact mathematical method of comparing the two angles, and when worked out for the passage of a light ray from air into crown glass, the figure 1.52 is obtained, which is the R.I. of glass.

Without admitting to an interest in the mathematics of R.I., one may still recognize the utility of this expression by understanding that it is an exact numerical way of stating the amount of bending that a given substance will impart to light rays—glass has 1.52 times the refracting power of a vacuum or of air.

This figure is termed the *absolute refractive index*. If we wish to compare one substance to another as to its powers of refrangibility we divide the absolute R. I. of the substance containing the refracted ray by the absolute R.I. of the substance containing the incident ray, the result being the *relative refractive index*. When not otherwise stated, the R.I. of a given substance is always to be understood as the absolute R.I.

Let us see what R.I. can mean in a practical case. The R.I. for water is 1.33, for crown glass 1.52, for cedar wood oil 1.51 and for balsam 1.52. Some years ago it was customary to immerse high power objectives in water, placing a drop of water between the cover glass of the slide and the end lens

of the objective, designated as a water immersion objective. Today this system is rarely used, the highest power of objectives being designed for use with cedar wood oil and termed oil immersion lenses. From the figures given it can be seen that light rays will suffer considerable refraction with the use of water as an immersion medium, but scarcely any when oil is employed. It is also evident that balsam makes an ideal mounting material for objects on slides since it has the same R.I. as glass, and will not alter light rays passing through a slide.

Turn now to lenses. These have one or both surfaces curved and are designated by such self-explanatory terms as plano-convex, biconcave, plano-concave, and the like. Usually the curve is spherical—i.e., a segment of a sphere—and if we plot the remaining parts of the two intersecting spheres and draw a line connecting their centers we have what is termed the *principal axis* of the lens (fig. 3). There is one point on this axis, either inside or outside the lens, depending on its shape, where light rays will pass through without any angular deviation; this is the

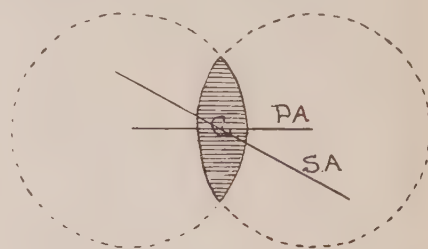


Figure 3

optical center of the lens (fig. 3). Any straight line other than the principal axis drawn through the optical center is termed a *secondary axis* (fig. 3).

Armed with the foregoing definitions and information, we are in a position to understand what happens to light rays in traversing lenses. The two principal forms, biconvex and biconcave, can be considered in each case to act like a pair of prisms. In the biconvex the prisms have their bases together; in the biconcave, their apices are together (fig. 4). Remembering that light is refracted toward the base of a prism, this means that, in a biconvex lens, light rays are gathered and the lens is termed *converging*, whereas in a biconcave lens, the rays are scattered and the lens is *diverging*. All lenses are combinations or modifications of these two types.

Or, put in another manner, since glass is denser than air, light rays passing from air into a lens are bent toward the perpendicular, and passing out on the other side are bent away from the perpendicular. In a biconvex lens this converges the rays to a point; in a biconcave lens the emerging rays are diverged.

In a converging lens the rays are refracted so as to meet at a point beyond the lens, known as the *principal focus* (fig. 5). Of

course one could reverse the direction of light and send it through the lens from the opposite side and find that there was also a focal point there that matched the first one; this is the principal focus of that side and the two focal points together are termed the *conjugate foci*. If both surfaces of the lens have the same curvature, these foci will be equidistant; if the surfaces



Figure 4

are segments of spheres of different diameters, one focal point will be farther from the optical center of the lens than the other focal point. These foci are *real* and form *real images*—pictures of objects that would be present whether or not a human eye were there to see them.

Biconcave lenses, on the contrary, because they scatter light rays, have no real focal points (fig. 6). If we extend the emergent lines backward through the lens toward the light source, however, they will meet in a theoretical point known as a *virtual focus* and such lenses produce *virtual images*. These have no real existence and are purely of use in illustrating the optics of such lenses geometrically.

With these preliminaries digested, we will be ready in the next issue to describe images formed by lenses and to consider the kinds of lenses used in microscopes, and why it is that they magnify.



Figure 5

Beginner's Primer

Xylol, also termed xylene, is generally considered as the most satisfactory of all *clearing agents* in microscopy, by which objects are rendered translucent (cleared) before mounting in balsam. This substance is a colorless, oily liquid, a hydrocarbon with the chemical formula C_8H_{10} , meaning that it is composed of eight atoms of the element carbon and ten of hydrogen. It belongs in the benzene series and occurs in coal and wood tar and in certain kinds of petroleum. It may also be prepared synthetically—artificially. In its turn xylol is the parent of a whole series of other compounds.

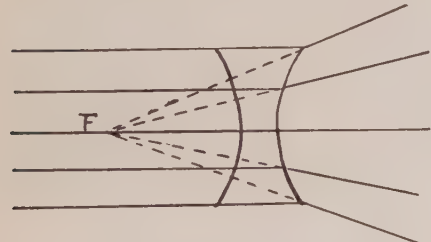


Figure 6

The name comes from the Greek word for wood.

Xylol has the advantage of hardening tissues, but evaporates so rapidly that in its use one must take care never to let organic material that has been in xylol become dry. This will happen quickly and ruin the preparation unless the operator is watchful. It imparts a roughened, dry and uncomfortable feeling to the fingers, though readily removed with alcohol or counteracted with warm water and soap.

Being miscible (mixable) with balsam, xylol is customarily employed as a solvent for that resin, as previously noted. It is also miscible on the one hand with pure alcohol, and on the other with melted paraffin; hence it constitutes an essential step in putting alcohol-preserved material into paraffin for sectioning, alcohol itself not being miscible with paraffin. Xylol is not at all miscible with water—in fact it will not tolerate the slightest trace of water, turning milky if it is present. It is therefore used in determining the purity of absolute (100%) alcohol. A few drops of the supposed absolute alcohol are mixed in a watch glass with a drop of xylol; if the mixture remains colorless, the

alcohol is pure; if it turns milky that alcohol contains water and is not fit for use as absolute.

Historical Outline

In addition to Dutch inventors of the compound microscope and telescope, discussed previously, there remains for mention the problematical role of Cornelius Drebbel (1572-1634) of Alkmaar, Holland. This versatile scientist did most of his work in England and is credited with constructing water engines, fireships, a perpetual motion machine which he presented to James I, a submarine boat, and many other mechanisms. He is known to have been the first to introduce both the microscope and telescope into England, but he seems to have been careless with his claims, one of which concerns the thermometer, which he brought also to England and falsely stated to be of his own invention.

Whatever may be his relationship to optical instruments as an inventor, Drebbel certainly began their manufacture in 1621, and apparently it was one of his instruments that Galileo was called upon to examine in Rome in 1624.

The English mathematician Digges (1571) foreshadowed the invention of telescopes, while the French may put forward their optician, Chomez, as a claimant for priority in microscope design.

However, aside from the Dutch, the really important personalities concerned with optical inventions were Italian. Salvina D'Armato, who died in Florence in 1317, is credited by his countrymen with the discovery of spectacles, though evidence is at hand to show that he received his ideas through Roger Bacon, the Englishman, who antedated D'Armato by some fifty years.

The great name in Italian science of the period is that of Galileo Galilei (1564-1642), who is stated by Singer to be the really effective inventor of both the microscope and telescope, since he was the first person to make these instruments the common property of science.

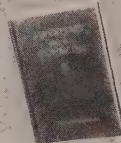
The usual story relates that in 1609 he heard rumors of the invention by a Dutchman of an instrument for viewing objects at a distance, and immediately set to work to exercise his own knowledge and skill to make such an appliance himself. His first telescope consisted of a plano-concave eyepiece and a plano-convex objective mounted in a tube of lead, according to Ford, giving a magnification of 9X, but this was soon followed by greatly improved models with magnifications up to 1000X.

Some uncertainty still clings to the relationship of Galileo to microscopes. In 1609 he published some microscopical observations on minute objects (Locy), and in 1610 we have accounts of one of his students, as quoted by Fahie, of frequently hearing Galileo describe the use of an instrument for examining insects. A recurrent story has it that the great Italian presented a microscope to Sigismund, King of Poland, in 1612.

In spite of all such accounts, however, some authorities believe that Galileo did not become acquainted with the microscope until he examined Drebbel's instrument in 1624, and that he thereupon made others himself, at the same time stating, whether falsely or otherwise, that he had made them before. Also there is Fontana, of Naples, making a

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microscope in 1618 and claiming priority in the discovery for himself.

The Galileo Museum in Florence has examples of his telescopes which may still be examined, but the two relics of his microscopes are dubious: the tubes being questionably genuine and the lenses missing.

In summary of this early pioneering period, it would seem that the majority expert opinion gives the prior claim to Zacharias Jansen of Holland (1590) as the first inventor, and the palm to Galileo Galilei (1609) of Italy as the effective inventor of both microscope and telescope, all other names being of secondary importance.

Trade Notes

The third of three notable booklets issued by the Spencer Lens Co., Buffalo, N. Y., is announced for distribution and is especially timely in connection with our own discussions of lenses and the history of their types, invention and improvements.

"I Saw Them Making Microscopes," by John Thomas, is a very entertaining and graphically written account of a trip through a modern optical instrument plant, and is beautifully illustrated with many fine photographs. As the title implies, the reader is taken on a personally conducted tour by a layman, and what he sees is explained in the language of the journalist rather than that of the scientist.

Send a three-cent stamp to NATURE MAGAZINE for your copy of this noteworthy addition to your collection of booklets on the microscope.

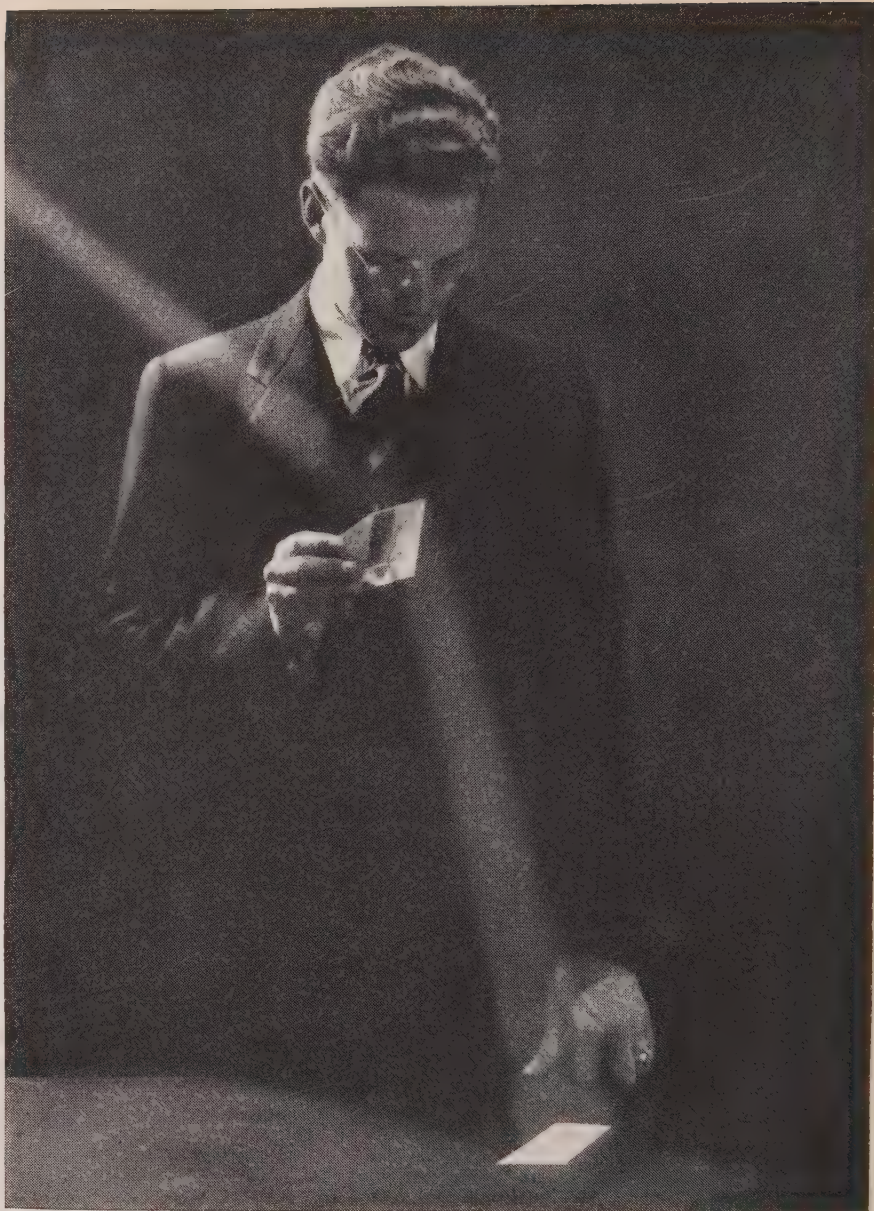
* * *

Publication of a new edition makes an appropriate occasion for mention of our own book, and we can do no better than quote the review given the first (1934) printing by the *Scientific American*.

"We have received for review a copy of a newly published book entitled *Adventures With the Microscope*, by Julian D. Corrington, Ph. D. . . . and have read this volume with keen interest. It covers just about everything under the shining sun which could be regarded as possible work or fun for the amateur microscopist: the microscope and its operation; microscope accessories; collecting microcosmic materials (protozoa, algae, and so on); soil microscopy; mineral microscopy; insect microscopy and technique; hair and fur microscopy; photomicrography; drawing with the microscope; plant studies (sections); bacteria studies; tissue study; microscopy of body parasites, and other things.

"No such book has ever been made available to the English-speaking amateur, and this is the book we have long wished someone would write, for there has been no all-around hobby book for the amateur microscopist and we have been forced to recommend makeshifts. Its viewpoint is strictly amateur and it is practical. It has 455 pages and 365 illustrations, and is a large book."

Dr. Heinz Rosenberger, of the Rolab Photo-Science Laboratories, states that "this book is splendidly written and, I am certain, will draw many into the ranks of amateur microscopists. It will also be a source of information for the more advanced amateurs through the variety of material given." In Dr. Gage's latest edition of *The Microscope*, he says (p. 592), "This is a charming book covering a wide range and is especially designed for the amateur, but



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Under the Microscope is a department of NATURE MAGAZINE designed for those readers interested in microscopy and maintains a service to render assistance with problems in this field. You are invited to take advantage of this service. Address all inquiries to Julian D. Corrington, NATURE MAGAZINE, 1214 Sixteenth St., N. W., Washington, D. C.

Sincerely,

JULIAN D. CORRINGTON.

The Gathering of the Clan

by Evelyn Chess Baltzar

On a warm, sunny December morning my husband and I decided to play archery golf around our quite "hazardous" mountain golf course. About half way around we sat down to rest. Suddenly, from either side of us, came the loud calls of valley quail. After each signal came a minute of quiet, followed by a cautious rustling through the weeds and chaparral. Gradually the scattered flock came closer and closer to their meeting place not more than fifty feet from us. The three-

syllabled call was changed to a cheerful clucking as newcomers were greeted by those already assembled. Excitement was in the air as from all sides stocky figures came running with heads erect, or slowly stalked across the little clearing with heads bobbing with each step as they uttered a "tek, tek", as though to impress others with their own importance. One lordly old male marched grandly by with his plume dangling over his forehead with all the dignity and grace of the potentate he really was. We sat entranced, hardly daring to move although an oak tree partly concealed us. There must have been a hundred and fifty quail gathered in that noisy, happy meeting. After a few minutes spent in much excited gossiping, the meeting broke up and our plump, lovable little friends started drifting away in little groups, for all the world like students at the close of a school day. Some sauntered slowly along chattering, others whirled on quickly out of sight.

How glad we were it was we who were watching, instead of hunters! We feel that we have witnessed one of Nature's grandest shows. Now as I am sitting in our living room writing this a covey of mountain quail is quietly eating under our birdfeeding table. As interesting as this sight is, it cannot compare with our morning's episode.

FAST GROWING SHRUBS

(Continued from page 158)

15 feet high and about as wide, leaving ample room for a seat underneath. A three foot shrub should be five to six feet high by the end of the first summer if planted in March or April. Although a huge shrub, it is one of the choicest of all honeysuckles.

The more common Tatarian honeysuckle is almost as rapid a grower. It is more compact, lower branched than the Maack, but does not have the rich green color or the late hanging leaves. The berries, either red or orange, ripen in summer and are off by winter. The flowers are more conspicuous than in the Maack, a good strain of the pink variety being quite showy when in bloom.

The Morrow honeysuckle is one of the most reliable of all shrubs, growing under all conditions. Like the preceding two it will grow in sun or shade; unlike them it grows but little more than six feet in height, but it will have a spread of ten feet or more by that time. It holds its foliage later than the Tatarian but not as late as the Maack.

A number of the mock-oranges are fast growing, but the one easiest to obtain and as satisfactory as any is the sweet scented common mock-orange, *Philadelphus coronarius*. A grand shrub, growing 12 to 15 feet high, usually considerably taller than broad, it has good foliage from spring until fall, when its bloom, glossy fragrant white flowers with yellow stamens, scents the whole yard. As with the honeysuckle, it will grow in sun or

shade, but blooms best in sunny exposures. A good small shrub is one of its sisters, the Lemoine mock-orange. Rather slender and erect, its four foot branches with their tiny leaves bear equally small flowers.

Where space is at a premium and a tall, slender shrub is desired, nothing will do the job better than our old friend the pussy-willow, *Salix*. The European variety has better foliage and larger blossoms than the native form. While all the preceding tall shrubs should be planted five to six feet apart, the pussy-willow can be planted every three feet. Even pussy-willow branches brought indoors in early spring and rooted in water often can be set out as a hedge and made to grow. For best results give the pussy an unmerciful pruning every spring. Or if you prefer to be generous and give all the branches away, it will grow out better than ever. It even can be cut to the ground every year and will shoot up six feet or more by mid-summer.

The privets likewise can always be relied upon to produce results. There are several we may choose. Hardest and tallest of all is the European privet, *Ligustrum vulgare*. With its dark lustrous green leaves that stay on until Thanksgiving, its terminal clusters of glossy black berries and its delightful white flowers, it is always dependable for wet ground or dry ground, severe winters or mild, sun or shade. Its height of ten to twelve feet is its only handicap, for it is a big shrub.

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(Continued on page 192)

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NATURE IN PRINT

As a convenience to readers the books reviewed in this department of Nature Magazine may be ordered through the book department of the American Nature Association.

Koala

In Australia live many queer animals that can be found at no other place on the globe. One of these is the koala, sometimes called Australia's native bear. Robertson and Mullens, Ltd., publishers of Melbourne, announce publication of two new books on this curious animal, one authored by Ambrose Pratt, the other by Charles Barrett. Both volumes are profusely illustrated with photographs of koalas in various interesting poses, and Mr. Pratt's work, priced at six shillings, contains a scientific section that deals with classification, anatomy and psychology of the koala. The volume by Mr. Barrett contains the story of "Edward," a delightful koala pet, and is priced at two shillings.

American Frontier

The rhythmic prose that distinguishes Elisabeth Peck's *American Frontier*, a book of poems depicting life in what was once western America—the Ohio Valley, Kentucky and Tennessee—and on to the country of cattle and gold, and fruit, will be enjoyed both by Nature and poetry lovers. The author has based her work on fact material found hidden away in old letters, journals and other documents, and she travelled as far as the British Museum to bring to light forgotten data of the pioneering era. Of particular interest to outdoor lovers will be those poems entitled *White Man, Deer, On the Sunny Slope of Pilot Knob, Wild Geese, Maturity*—John J. Audubon, and *Stars*. The volume is available from the publishers, Doubleday, Doran and Company, Garden City, New York, for two dollars.

Sunspots

Nearly all of us are engaged in some vocation, the primary purpose, perhaps, being to maintain a degree of solvency and pay the monthly grocery bill. Few of us, therefore, have the time or inclination to concern ourselves with the sun, the great flaming ball that, although some 92,000,000 miles away, is essential to all life on earth. Man is even less concerned about sunspots, fundamentally caused by atmospheric disturbances in the surface layers of the sun. However, men of science are beginning to wonder if there may not be some connection between sunspot activity and business activity on our planet, and today there is a growing belief that sunspots exert a wide and important influence on human affairs. Facts reveal that trees show more growth when sunspots are more numerous and that business activity has followed sunspots through-

out the last decade. It is further interesting to note that the Dow-Jones stock market averages from 1925 to 1937 coincide to a marked degree with the rise and fall of the number of sunspots observed in that period. These are only a few of the many parallels drawn in a new book by Harlan True Stetson entitled *Sunspots and Their Effects*. The book is strictly popular, and the author outlines factual evidence available and examines critically some of the more plausible hypotheses advanced to show relationship between sunspots and our economic ups and downs. The author, however, does not attempt to reach final conclusions where evidence is incomplete, and warns the overcredulous not to quote speculative statements without including the qualifications that accompany them. The volume, which will be enjoyed by all desiring to keep abreast of the trends in science, is available from the McGraw-Hill Book Company, New York, for \$2.00.

Wildlife Bulletin

A new Roosevelt Wildlife Bulletin, *The Effect of Deer Browsing on Certain Western Adirondack Forest Types* has just been issued by the Experiment Station at the New York State College of Forestry at Syracuse, N. Y. Editions of these serial publications are limited and do not permit general distribution, the sale price being based on actual printing and distribution costs. Prices, as well as a complete list of Station publications, will be furnished on request. Communications should be addressed to The Director and Editor, Roosevelt Wildlife Forest Experiment Station, Syracuse.

Ascaris

Just as Jean Fabre, distinguished naturalist, used the bee as a focal point for his work on the insects, so has Dr. Richard Goldschmidt, Professor of Zoology at the University of California, chosen a tiny worm, *Ascaris*, as a starting point in seeking the answers to the myriad mysteries of all living things. *Ascaris, the Biologist's Story of Life* is profusely illustrated and written in non-technical language; it will be eagerly read by the layman interested in the amazing interrelations of all forms of life. The volume is available from the publishers, Prentice-Hall, Incorporated, New York, for \$3.25.

Sky Pageantry

Writings of the ancient Greeks disclose that there was some knowledge of the stars and planets long before their time. In fact, they borrowed their astronomical knowledge from the Egyptians, who, in turn, admitted an indebtedness to the Chaldeans. It is believed today that the constellations were named by the Akkadians, a Semitic people living in what is now Armenia, about 3000 B. C. Although that was approximately 5000 years ago, scientists still are searching the skies with powerful telescopes in attempt to solve the riddle of the universe. Throughout the span of centuries, the orderly march of the constellations across the heavens has continued uninterrupted, offering their challenge to man to find the answer.

The Pageant of the Heavens, a new book by Frederick Warren Grover, was written for those desiring a first-hand knowledge of

the stars and planets, and although it is non-technical and does not attempt to answer our riddle, it is an excellent volume for the layman as an introduction to general astronomy. Special attention is given to the constellations, and eight star maps are contained in a pocket attached to the back cover that enables the reader, with the aid of a small flashlight, to study the star-groups in the field. The volume deals almost entirely with those phenomena that require no optical aid, but should be quite useful to the amateur astronomer who has his own telescope but lacks familiarity with the heavens for its intelligent use. Our solar system, of course, comes in for its share of the discussion, and directions are given for finding and identifying the visible planets. Published by Longmans, Green and Company, the book is available from them for \$3.00.

Physics Glossary

Glossary of Physics, by Le Roy D. Weld, professor of physics at Coe College, Cedar Rapids, Iowa, is a 255-page book containing definitions of approximately 3250 physical terms, including many terms from adjacent fields often used in physical science literature. An outstanding feature is the use of references to books and periodicals in which the terms are discussed more at length. The book is published by the McGraw-Hill Book Company, New York City, for \$2.50.

Tree and Marsh Folk

Miss Phyllis Kelway writes charmingly of her many animal friends of the English countryside but nowhere quite so interestingly as in her latest book, *Swift Movement in the Trees*, published by Longmans, Green and Company, New York, and priced at \$2.50. Here she is chiefly concerned with the red and gray squirrels (short-sightedly imported from North America), the shrew, the toad and the moorhen. The photographic illustrations, as usual, are a delight.

Australia's Entail

Those interested in Australia's soil erosion problems will welcome *Australia's Entail*, by A. O. Barrett, to their libraries. It is an excellent treatise on soil conditions that are comparable to our own and reiterates the value of trees on watersheds to prevent rapid run-off of rain waters. The author tells why, in words that would apply to America, man can persist in Australia only if he guards his soil. The book is priced at 6 shillings, or \$1.50, from Robertson and Mullens, Ltd., Melbourne.

Oysters

A new volume entitled *Oyster Biology and Oyster Culture*, by J. H. Orton, presents to the general as well as to the scientific reader an epitome of modern knowledge relating to habits, life-history, feeding, digestion, spawning and shell growth of oysters the world over. Methods of oyster culture also are reviewed in the book which is based on the Buckland lectures for 1935. The author is professor of Zoology at the University of Liverpool, and the book is available from Longmans, Green and Company, New York, for \$2.00.

By-products for Birds

One of the most interesting "by-products" of an industry that has come to our attention is the wild bird nesting material of the Hoffman Lion Mills Company, Incorporated, of Fall River, Massachusetts. The organization, makers of ropes, mops, clothes lines, cheesecloth and other related products, is selling, through the five-and-ten-cent stores, various grades and sizes of strings and cotton waste that make admirable nest material. Strands from a box of this, hung out in the back yard, should attract scores of birds in the spring and summer, and the cost is small compared with the pleasure obtained from watching our back-yard friends make use of this material.

Busy Beavers Banished

A colony of beavers that diverted all the water from an ice pond at one of the hotels in Rocky Mountain National Park were trapped and transported to another location recently after all attempts to discourage their dam-building proved unsuccessful. It is hoped the beaver emigrants won their race with winter in their new location, as they must provide both habitations and food supplies before the advent of deep snows and the icy roof that will cover their pond.

Illinois Tree Planting

Conservationists and all those interested in erosion control should get a copy of *Forest Planting on Illinois Farms*, published by the University of Illinois College of Agriculture in cooperation with the Illinois State Natural History Survey. The pamphlet, which declares trees are necessary on more than 3,000,000 acres of Illinois farm lands, points out, with text and photographic illustrations, the methods of planting various types of trees in different soils. Erosion can be stopped if we work now, the booklet points out, and "where other generations have thoughtlessly destroyed, this generation has an opportunity to build." The pamphlet is available from the University at Urbana, Ill.

New Alaskan Refuge

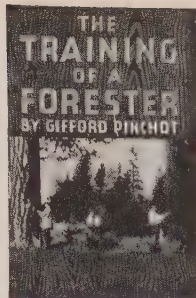
An executive Order of December 14, 1937, has established the Hazen Bay Migratory Waterfowl Refuge, comprising the Nunivak-chak and Krigegak islands of Hazen Bay, Alaska.

Earth Lore

Most laymen enjoy a bit of scientific reading now and then, particularly if it does not contain too technical terms. *Earth Lore*, by S. J. Shand, is such a work, presenting in a clear and fascinating manner that which is important to the understanding of simple geology. The title page contains a rhyme by J. H. Frere that proclaims the spirit of the book. It says: "And don't confound the language of the nation with long-tail'd words in -osity and -ation." With such a beginning, *Earth Lore* presents the story of the globe we live on in an absorbing manner, answering many provocative questions concerning geological phenomena. It is available from the publisher, E. P. Dutton and Company, New York, for \$1.25.

The Training of a Forester

By Gifford Pinchot



THIS completely revised, enlarged and partly rewritten fourth edition is intended not only as a guide to young men who are considering forestry as a profession, but also for their parents and all who wish to make this important present-day subject a hobby. No man is better qualified than former Governor Pinchot to write on forestry and the forester, as he is a man who loves forestry for its own sake. It was a hobby with him from early days. In this volume he has written a singularly clear and attractive account of what forestry is . . . and what a forester must know.

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New Aquaria Nearing Completion

Two huge aquaria that will duplicate natural conditions found on the floor of the ocean are nearing completion at Marineland, Florida, eighteen miles south of St. Augustine. The giant tanks, the largest individual aquaria ever built, also will be the world's only specially-designed underwater motion picture studio, and will present a panorama of life on the ocean floor. One tank is rectangular, measuring 100 feet long, forty feet wide and eighteen feet deep; the other is circular, 75 feet in diameter and eleven feet deep. Enclosed galleries that surround the tanks will enable scientists and tourists to observe the life within through portholes at four different levels: from the bottom of the tanks looking upward, from the sides at a level just above the bottom, from the sides just below the top and from an open gallery around the top of the tanks. The design of the tanks was approved by technical experts of the motion picture industry who worked out the various camera angles necessary to afford producers the greatest latitude in the filming of scenes. As an example of the desire to create conditions as they exist in the sea, W. Douglas Burden, president of Marine Studios, builders of the project, states that a coral garden will be built into the tanks and that brilliantly colored coral fish will be obliged to elude their enemies as they normally do, by escaping among the crevices of the coral growth. Besides a wide variety of small fish, the tanks will hold sharks, giant rays, porpoises and an octopus.

Marine Studios is an enterprise representing an investment of approximately half a million dollars launched by Messrs. Cornelius Vanderbilt Whitney, Nicholas S. Ludington, Albert G. Redpath, Sherman Pratt, Blake Lawrence, Ward Cheney, Ralph H. Poole, Jr., and President Burden, who is also a trustee of the American Museum of Natural History, New York.

International Peace Garden

On the Canadian boundary near Minot, North Dakota, is the International Peace Garden, uncompleted as yet, designed to commemorate the long period of peace and good will that has existed between the Dominion of Canada and the United States. The project was undertaken by International Peace Garden, Inc., with the belief that the plan for the creation of the Garden of Peace "is a manifestation of world consciousness against war—" and "—that a nation's greatness should not be measured by the size of its armies or battleships, but by the standard of its cultural, social and economic structures and by its capacity to live on terms of friendship with neighbor nations." A greater part of the work done to date has been of ground-breaking character, a C.C.C. camp established in 1934 having accomplished more than 70,000 man days of work to July 1, 1937. Work on the American side is under the direction of the National Park Service in cooperation with the State Historical Society of North Dakota. Canada, meanwhile, which spent \$72,000 on their side during 1936, allotted another \$10,000 for the fall of 1937. The rolling hills of the surrounding area are known as the Turtle Mountains, where wildlife abounds. Hundreds of small, shallow lakes, located between the hills, are ideal for the propagation of waterfowl, and

it is said that the period between June 15 and July 4 brings a remarkable display of wild rose blooms that gives the impression that the underbrush consists entirely of rose-bushes. We hope, when completed, that the garden will be a living symbol of universal brotherhood as well as an inspiration to mankind. Those wishing to know more about the project should write to the Committee on Garden Information, Minot, N. D.

Build Bluebird Houses

To encourage the building or provision of homes for birds, the Burroughs Nature Club of Kansas City, Missouri, offers simple plans for bluebird houses. A self-addressed, stamped envelope sent with your request to W. H. Hoffstot, Burroughs Nature Club, 14 East 55th Street Terrace, Kansas City, Missouri, will bring the plans.

New Canadian Sanctuaries

Perroquet Island, near the Strait of Belle Isle, and the Heron Island Bird Sanctuary, located in Quebec on the south shore of the St. Lawrence River, have been added to eastern Canada's bird sanctuaries that now stretch from the Straits nearly to the New York state line. Professor Wynne-Edwards, president of Quebec Society for the Protection of Birds, has announced the purchase, by the society, of Perroquet Island, to become a part of the Bradore Bay Bird Sanctuary. The island, during the summer, is the nesting place of more than 50,000 puffins and many other sea birds. The Canadian Government's Heron Island Sanctuary is located near Montreal, the area including part of the Caughnawaga Indian Reservation, and will give protection to many kinds of ducks, plovers and sandpipers.

Don't Eat too Fast

Wesley Thompson of Rudyard, Michigan, went to the hospital to have a bone removed from his throat. The efficient doctors had no trouble with the case, but Thompson ran into plenty after the operation when conservation officer L. E. Jankowski learned the bone had come from a deer. Thompson later pleaded guilty to possessing venison out of season and was fined \$50 and costs.

Jack Retires

Turning out for a full dress parade in honor of the occasion, the 62nd Coast Artillery, Uncle Sam's champion anti-aircraft regiment, recently officially retired Jack, a 29-year-old Army mule that had been in the service for 27 years. The retirement order, drawn in official language, was read by Captain J. H. Madison, regimental adjutant, before the entire regiment. Twenty officers then marched from the ranks, saluted Jack and returned to their positions. At a signal from the commanding officer, the entire 62nd marched past the faithful animal, dipping colors and executing "eyes right." Needless to say, Jack will have the finest stable and the best oats to the end of his days, and, under the terms of the retirement order, "he shall not be called upon again to perform any duty or labor whatever so long as he shall live." Such a ceremony, and no officer has ever been more formally honored for

long service, is a credit to the United States Army; it will tend to deepen our appreciation of the dumb animals that so loyally and faithfully serve man.

Gulls Banded

To further the cooperative study of the migration and other habits of herring gulls, the Linnaean Society of New York, the National Association of Audubon Societies and the Northeastern Bird Banding Association have banded 5000 of these birds at ten key banding stations along the Atlantic Coast from Labrador to New York State, the U. S. Biological Survey announces. Brightly colored bands are used in connection with the usual aluminum numbered ones in the hope that "sight recoveries" while the birds are on the wing will speed up the tracing of their movements. Data on fall and winter distribution is limited, and in the past this information has been slow to accumulate, as in most cases the recovery of bands had to await death or injury of the carriers.

New Member

Add to the membership of NATURE MAGAZINE's informal correspondence club the name of Mr. Laurence Gravel, 16 Rosedale Avenue, Greenville, Pa., who would like to correspond with members of the American Nature Association interested in Nature and science in general, and in astronomy and oceanic life in particular.

America's Playgrounds Popular

More than fifteen million persons visited the areas administered by the National Park Service during the travel year ended September 30, 1937, a 26 per cent increase in attendance over the record-breaking 1936 season. These figures indicate that one out of every eight persons in the country visited some unit of the National Park and National Monument system in 1937.

Believe It or Not

Some fifteen years ago Mrs. Paul T. Hurt, a member of the Nature Study Club of Indiana, purchased what she thought was a sugar pear tree. Instead of the tree bearing the small russet sugar-sweet pears, however, it produced the large yellowish-green pears of the Bartlett type. The tree, enduring accusations of fraud that were heaped on its head for a period of years, decided to do something about it. Last season it was discovered that nearly every branch bore one or more of the sugar pears in addition to several of the larger type. Horticulturists say that such a thing just isn't done, but the botanists called it a natural plant chimera—a phenomenon that has been assumed to be possible, but never before has been reported as actually occurring.

Sanctuary Enlarged

Presidential proclamation has enlarged the St. Marks Migratory Bird Refuge, located in Wakulla, Jefferson and Taylor counties, Florida, by approximately 31,445 acres, by Executive Order No. 7749, dated November 22, 1937. The refuge now includes several islands in Apalachee Bay.

SILT IN RESERVOIRS

(Continued from page 166)

in this basin alone, but wherever silt problems exist."

Mr. Collins closes with a general discussion of the direful results that attend the destruction by silting of any large reservoir, and this brings us to his vital question: "Can nothing be done to avert this catastrophe?" And his answer is no less provocative of thought. "To this question there is but one answer—it can be prevented, but not cured. . . . There is but one course open to us. It may be difficult, but it alone is effective. It is *complete erosion control of an entire watershed*. That is the only way to overcome this menace. There is no other practical remedy for siltation. Prevention is the only cure."

It must be apparent, when one reviews the causes that contribute to siltation on a large scale, that erosion control of an entire watershed, in such a case as the Colorado River, would be a project hopeless of attainment. Apart from the inherent physical impossibility of planting or otherwise controlling a watershed so vast, and so unpropitious, as that of the Colorado River (using this only as an example, as does Mr. Collins), it should be plain that the cost of such a project would be prohibitive. The greater the danger from siltation, the greater the cost of prevention. Such costs would necessarily be a charge against the project, and must needs be paid by succeeding generations of users of irrigation water or power.

Is, then, the situation a hopeless one? We do not think it is, at least as concerns electric power. There are several regions of our country where power can be produced in almost unlimited quantities by rivers whose basins are reasonably free from the danger of siltation. There are hundreds of such rivers that can produce lesser quantities. Power can be carried for long distances.

It seems apparent, therefore, that what we need is wiser planning of the use of rivers for power; that we must have projects—whether public or private—that recognize the threat from erosion and siltation, instead of ignoring that danger for political, financial or other reasons. We believe that eventually it will be necessary to confine production of electric power to river basins whose watersheds are capable of management at a relatively low cost, and to utilize the streams that have vast arid watersheds in other ways.

Nature Tour of Europe

Under the leadership of Kenneth E. Caster, Curator of the Department of Geology and Geography at the University of Cincinnati, a natural history tour of Europe will be made this summer. Space does not permit our recording here the interesting itinerary planned, or other details. These may be obtained by writing to William Maltby Barber, Educational Tour, Babson Park, Massachusetts.

Waltonians to Meet

The 16th Annual Convention of the Izaak Walton League of America will be held April 21 to 23 at the Hotel Sherman in Chicago, bringing together conservationists from all parts of the United States.



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A Titmouse Oddity

By Betty Hartz

It would be interesting and perhaps to our advantage if we were able to interpret some of the individual and rather unusual actions of various mammals and birds. To understand the peculiar and varied characteristics of numerous species of our feathered friends would be most instructive and entertaining, as in the following case, which I believe to be somewhat novel.

Although an amateur ornithologist, I was rather startled to have a small bird suddenly perch on my uncovered head while resting after lunch by an outdoor table in the rear of the cabin at Plummer Island, Maryland, a wild-life sanctuary where care-free bands of downy woodpeckers, nuthatches, chickadees, tufted titmice, and other species fly to and from the feeding stations all day, apparently unafraid and unmindful of anyone who may be about. As I tried, impulsively, to catch my assailant, a tufted titmouse, it flew to a dead cedar tree close by, from which my friend, Dr. A. K. Fisher, a life-long bird-lover, had suspended a coconut, newly filled with luscious suet. A few moments later the bird alighted on a branch overhead with its mate, and the two appeared to be disputing matters of great importance. After playfully scolding the titmouse for its boldness, I resumed the peaceful attitude of one busily engaged in the pastime of knitting, when the bird made a second approach. Feeling that my presence might be interfering with its enjoyment of a repast, I politely apologized and moved to the back doorstep of the cabin, an arrangement that I felt quite sure would be satisfactory for all concerned. But this was not to be, for only a few moments elapsed before the persistent, twittering tom-tit encircled the cottage, fluttered through the open front door, and, settling down on the arm of a chair near me, continued to remonstrate mildly. Being interrupted once more, I attempted to catch this impudent intruder, when it made a hasty retreat to the wide open spaces.

If members of the lower forms of animals "could only talk", the results might prove quite astonishing. The lowliest pup, although speechless, usually can make us understand his various moods of pleasure or discontent by the expression of his eyes, the movements of the ears or tail, and by his general behavior. In all probability the assumption that these animals generally follow the emotions of their masters is true. A dog, for an example, although unable to express happiness and contentment with an appreciative smile, as in the case of man, will wag his tail quite vigorously when some caressing hand fondles him, or tosses him a tidbit. With our present lack of knowledge of the thoughts and actions of birds, however, it is impossible even to guess what reactions caused this particular bird to make these advances.

Silver Threads at Home

By Mrs. Hartley H. T. Jackson and
Mrs. Clarence Cottam

On the afternoon of May 21, 1937, the writers were called upon in an unusual way to furnish nest material for a pair of tufted titmice.

While we were sitting on Cactus Rock at Plummer's Island, Maryland, a wildlife and floral sanctuary maintained in its natural state by the Washington Biologists' Field

Club, a tufted titmouse flew into the branches of the low bushes nearby. After chirping and gradually coming closer, it finally lit on Mrs. Jackson's shoulder, then on her head, and began to tug at her silvery-gray hair. Because it tried to get so many hairs at once, it only succeeded in hurting her to a point where she had to shake it from her head.

Not discouraged by this, it flew back in a few seconds and lit on Mrs. Cottam's head, where it succeeded in loosening several strands of her dark hair. Apparently it did not reach its nest with any, for after some flitting about and calling to its mate in the trees above, it made another determined attack on Mrs. Jackson's head, tugging with all its tiny might until it finally procured several hairs, then flew away to its nest.

Evidently this bird preferred a silver lining for its home.

The Thrill of a Lifetime

By Ida Laird

Yesterday, as we were coming home with the mail, my little niece suddenly exclaimed, "Oh, Aunt Ida, look!" Over to our left, by the Old Swimmin' Hole, were "millions of birds", as my niece expressed it.

I stopped the car right on the bridge, jumped out, rolled under the fence, hopped across the creek behind some willow brush, and crawled on my stomach, using my elbows for crawlers, to get a closer view.

When I was just close enough, I raised my head above the weeds to see the birds. Nature gave me a shock of red-brown hair not easily detected from the appearance of some of our dead swamp grass.

Ahead of me was the Old Swimmin' Hole with one bird on the bank, one at the edge of the water watching intently for food, another on a stump in the water, and still another on a log nearby. They were egrets, those beautiful rare white herons!

To me, that was the most thrilling event of my life.

A Cardinal Roomer

By Fannie M. States

For several years I lived where my landlady's kitchen was about fifteen feet from mine, and between the two was a covered place with a stone floor—a sort of porch that was level with the yard. Her dining-room was on the north side of this porch, her kitchen on the west side and lattice work adorned the south side. A part of the space on my side—the east—was always open, for my kitchen was small.

Several winters one cardinal—and at least one winter, a pair of them—had a shelter there. During some winters a basket hung from a nail in a rafter, and a Shredded Wheat box was fastened to the rafter one winter. The cardinal seemed pleased with either one. Twitterings and calls could be heard early in the mornings, but the droppings finally annoyed us and the bird's "bed-room" was removed.

During the summers a home was selected elsewhere. One summer a nest was made in a rambler rose-bush that grew over a trellis in the yard. The nest was suddenly abandoned and, as it was at a time when the young birds were too small to fly, the conclusion was that cats had destroyed them.

But it was of the habit the birds had of flying against my kitchen window that I es-

pecially desired to tell. A large lilac bush, large enough to be called a tree, grew by the south window. At times, for perhaps half an hour, the cardinal would first perch himself on a limb of the lilac bush and then dash himself against my window. It was interesting to watch him. I sometimes went into my landlady's kitchen to watch as there was not the danger of frightening him away and one could see how he managed much better. One time the two were in the bush and seemed to be taking turns in dashing against the window. They managed to strike the glass with their feet every time.

When the birds were not there I went outside and looked into the window to find out if possible what attracted the birds so greatly. I concluded that it was because they saw their reflection in the panes of glass. When alone, was Mr. Cardinal looking for a mate? When the pair was there, was it a desire to fight for supremacy or simply to be social?

A Futile Effort in Adaptation

By David W. Rial

On a return from a field trip one July day, I found a digger wasp, *Ammophila*, laboriously dragging a large smooth caterpillar along the ground. She was astride the larva, much as a boy might drag a heavy log along by placing it between his legs, his arms underneath it. Her objective seemed to be a small hole in the middle of the path about the size of a one cent piece. When within a few inches of the hole she dropped her heavy burden and began to reconnoiter to see if all was well, if an enemy might be in the offing, or to see if by chance she might have arrived at the wrong spot. Seemingly satisfied, she disappeared with her prey into the hole. I began to mark the spot by placing stones in a circle around the location so that I might later return to it. In a moment the industrious worker reappeared, but seemed to be disturbed with the change in the local geography. She flitted around excitedly for a while, returned to the hole, but gave up the problem and flew away.

Later I proceeded to unearth the caterpillar, which had been paralyzed in its motor nerve centers. On the side of its body was a small egg about the size of a pin head. We placed the caterpillar with a small amount of earth in a Mason jar and watched it.

As the larva increased in size the caterpillar upon which it was feeding was getting thinner and thinner, looking finally like a badly deflated inner-tube, but maintaining all the time its natural color. Not until all the juices seemed to be sucked out of it was there any apparent evidence of decomposition. A problem now presented itself to the larva inside the jar. From time immemorial wasps' larvae have woven themselves into cocoons, but the narrow holes in which they found themselves were not much more than a half inch in diameter. What adaptation would this larva make inside a Mason jar? It went about the solution industriously trying to spin a web over the soil inside the receptacle and all over the inside of the glass. Such a task was beyond all provision of Nature. To attempt such a procedure could mean nothing but complete exhaustion. Regardless of cost, the larva attempted the impossible. Adaptation is Nature's inexorable law even though in the attempt many die, but without which, perhaps, evolutionary progress could not be made.

Diana Howe's

DOG COLUMN



IRELAND may be without snakes but she is not without dogs that are more or less native to her soil. Just which of the various Irish breeds had ancestors of their present form there in the days of St. Patrick is difficult to determine. Except for occasional mention of the Irish deer and wolf hounds in the fifteenth century, one finds little to go upon. The exact origin of the Irish terrier is, therefore, like that of Topsy, "wrop in myst'ry".

Previous to the middle of the Victorian period, the "dog-cult", as we know it today, was confined to scattered dog lovers. There were few books dealing solely with the dog and treating of its origin, its breeding, its health or its care. Dog food was then any scrap from the table; dog-medicine, any medicament the local vet gave to the horse or the cow. Except for occasional poetic reference, there is nothing exhaustive or illuminating on the dog until about 1840. Even then there is scant reference to the Irish terrier and nothing about the Kerry or "blue".

My own experience with the Irish terrier has been peculiar and unfortunate, and, I am often told, not typical. He is without doubt a merry, sprightly and enjoyable creature, but sometimes just a little trying to the patience. This, to be sure, makes him an individual with ideas of his own, hence interesting. The one that I had specialized in what is known as "fits", and he was a specialist with a blind eye to any other branch of knowledge.

No circus clown devoted to the mastery of his art and absorbed in the creation and perfection of new "business" could have thought up so many new and bright ideas for his "act" as did Pat, who, in his daily performance while at exercise on the city avenues, brought me more blushes and unsolicited and undesired advice than I care to think of today.

I do not mean that Pat was sick, nor that he was "subject to fits" in the accepted sense of the phrase. No, he was not an epileptic, nor was he a fool! I mean, simply, that having thrown a genuine fit or two involuntarily in puppyhood he saw in the thing a method of drawing attention to himself that was worthy of cultivation. He gave more thought to this antic than to orders and instruction. The fact that in drawing notice to himself he involved the person at the other end of the lead was of no concern to him. I doubt if he ever gave it a thought. Pat was, in fact, an exhibitionist of the first order.

When he was a year old and pretty well accomplished, I thought that he might find his metier as a circus dog; but Pat's "act" was narrowly limited. A crowded street seemed to be essential to its success as a drawing-card.



He was also naïve in his conceit. It was, I am sure, an *idée fixe* with him that he was deceiving us! His ebullience in other directions also rendered him an awkward and expensive companion. His unique ability to discover and chew up our guests' shoes, gloves, handkerchiefs and hats made his upkeep a formidable item.

However, this is an (Continued on page 192)

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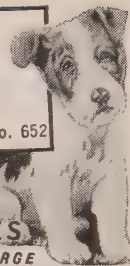
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SOIL OR SEDIMENT?

(Continued from page 146)

Can nothing then be done to avert such a catastrophe?

To this question there is but one answer—It can be prevented but not cured. At the present time there is no practical and economical way to desilt reservoirs. Even flood plains, river bottoms and harbors can be protected from silting only through enormous expenditures on levees or dredging, and then only uncertainly.

Partial checking of silting may put off the day of reckoning, or, perhaps, merely prolong the decline. There is but one course open to us. It may be difficult, but it alone is effective. It is *complete erosion control on an entire watershed*. This is the only way to overcome the menace. There is no other practical remedy for siltation. Prevention is the only cure.

Slow Lightning

Research reveals that all lightning flashes are not followed by the usual clap of thunder. K. B. McEachron, General Electric engineer in charge of high voltage and artificial lightning phenomena, says this is because all lightning flashes do not release their energy at the same speed. Thunder, according to Mr. McEachron, is the result of a pressure wave caused by the sudden expansion of air created by a quick lightning discharge. "Our studies," he continues, "have revealed that in some cases the electrical current is built up and released slowly; that is, in one or two tenths of a second as compared to millionths of a second in other discharges. This so-called slow lightning produces no sound. To the human eye it looks the same, and during a general storm the fact that one has heard no thunder in connection with any particular flash is generally overlooked."

Our Christmas Visitor

by Evelyn Chess Baltzar

Christmas Eve was ushered in with a fluttering of snowflakes and a cold wind. My husband came in from his work holding his lunch box with extreme care. I opened it rather curiously, not knowing what to expect. Inside was a tiny ball of yellowish green feathers—a ruby-crown kinglet. It had fallen by the power house nearly frozen to death. My husband had partly revived it by warming it in his hands. We pulled the coffee table closer to the fire and left the poor little fellow undisturbed to warm up. For about two hours he remained rolled up in such a fashion that we could not tell where his head was—so perfect the feather pattern. Then he started stretching his legs and wings and finally shook himself vigorously. He peered curiously around through his little white-ringed eyes, blinking in the light. Finally satisfying himself as to his safety, he took a sip of water we had placed in a teaspoon in the lunch box. Then he decided to explore the place. Our Christmas tree puzzled him more than anything else. From a curtain rod he discovered that the back of the tree was free from encumbrances, so in he flew. Finding a good perch, he lifted one foot,

put his head under his wing and slept peacefully until morning. Then we released him but until the storm was over he stayed close by and frequented our feeding table along with slender-billed nuthatches, titmice and Sierra juncos.



Almost the entire trunk of the tree pictured above has been distorted by a queer growth. The tree, located in Sarasota, Florida, continues to grow, however, as does the parasite. The picture was sent to us by William A. Rowley of Chicago, Illinois.

The Garden in Color

With three hundred and twenty pictures in color, Louise Beebe Wilder's most recent garden book is properly titled *The Garden in Color*. The arrangement of the plates and the text is seasonal and the latter is confined to descriptive and informational matter related to the subjects of the pictures. A number of exotic plants are included, giving the volume a wide range of interest to the garden lover. The author gives informal suggestions with respect to the best uses of the plants discussed in the garden scheme, and provides general cultural advice. The book is published by the Macmillan Company and sells for \$7.50.

Prize-winning Poems

For the past twelve years the Chattanooga Writers' Club has sponsored Nature poetry contests, during which time more than five thousand poems have been submitted for judging. Each year, the prize winners have been selected by a nationally known poet. With the conclusion of the awards for 1936, the Writers' Club has published a volume, *Prize Winning Nature Poems*, which contain some of the best poems submitted since 1925. The book contains 56 poems in all, a collection in which any Nature lover will find enjoyment. The volume is available for \$2.00 from Mathis, Van Nort and Company, Dallas, Texas.

Variable Stars

The Nature of Variable Stars, by Paul W. Merrill, an astronomer in the Mount Wilson Observatory at Pasadena, contains interesting and valuable material for both the trained student of astronomy and the layman who is

interested in the wonderful universe around us. The volume outlines our present knowledge of variable stars; how their light changes, how they move about in our galaxy and what they tell us about stellar evolution. The Macmillan Company, New York, is the publisher and the book is available for \$2.00.

Garden School

The Sixth Annual Free School of Horticulture, sponsored by the garden department of the Illinois Federation of Women's Clubs will be held at the Stevens Hotel, Chicago, on March 7. There will be three sessions, for which six speakers have been engaged.

Butterfly Collector

F. M. Suson, who lives at 168A Bonifacio Street, Cebu, Philippines, writes that he is an amateur butterfly collector and that he would like to correspond with and exchange specimens with similarly-minded people in the United States. Mr. Suson's letter is further interesting, especially when he writes: "In my country there are very few students of Nature. However, with the coming of books and magazines like *NATURE MAGAZINE* in our libraries, we are looking forward to having some day a group of people who will take an interest in the study of Nature as you have in the United States."

Smoky Mountain Hiking

If you are planning to hike in the Smoky Mountains this year, you will find the 1938 handbook of the Smoky Mountains Hiking Club, Knoxville, Tennessee, handy to have along. It contains the Club's program for the year, a number of suggested hikes, and a trail map.

Dr. Russell Appointed

Dr. Charles Russell, president of the State Teachers College at Westfield, Massachusetts, has been appointed curator of the Department of Education of the American Museum of Natural History. He fills the vacancy left by the death of Dr. George H. Sherwood.

A Book of Poems

Light on the Leaves is the attractive title of a book, largely of Nature and outdoor poetry, by William Sheppard Sparks. Although his verse has been widely published, this is the first collection. Mr. Sparks is a poet in the modern manner, writing in free verse that is terse and pictorial. This first collection is brought out by Henry Harrison, 430 Sixth Avenue, New York City, and the little book sells for two dollars.

Michigan Biological Station

Announcement is made of the program and staff for the thirtieth session of the Biological Station of the University of Michigan from June 27 to August 20. Annually held on the shores of Douglas Lake, this session provides opportunity for teaching and research in botany and zoology. Vol. 39, No. 37 of the official publications of the University of Michigan at Ann Arbor contains all the details.

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- No. 40—How to Make and Maintain Your Lawn.
- No. 41—Camp Cookery.

Of the new series of bulletins the following are available to members for a three-cent stamp and to non-members at ten cents and twenty-five cents respectively.

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FAST GROWING SHRUBS

(Continued from page 183)

Ibota privet and still smaller is the Regel privet. Not quite as hardy but able to withstand twenty below zero, these two shrubs may be used for hedges or group planting. Their blue black berries decorate them in winter as do their brilliant green leaves in summer. In fact, they are most striking when allowed to grow without shearing, as every leaf seems to be arranged with such precision.

A hybrid between the Ibota privet and its tender sister the California privet is the Ibolium privet. Usually it is as hardy as the Ibota with much the same persistent foliage of the California. The Ibota and the Ibolium grow six to eight feet in height.

Although hardly shrubs, it is almost impossible to pass over two of the poplars that have such universal use for quick effect. Not the Lombardy poplar, which although beautiful is overly inclined to be injured by oyster shell scale and twig blight, but two others. The Bolleana poplar, it has an upright form of the silver poplar, and usually the most permanent of this type. Its gray green foliage and its gray green twigs make it decorative in winter as well as summer. The habit of growth is tall and narrow. Much broader in its habit of growth is a relatively newcomer, the Simon poplar. Much greener in leaf than the Bolleana poplar, it has a grayish tone rather than the yellow green of the Lombardy. The leaves are quite distinct, being broader near the end than at the base.

Either of these trees should grow five to six feet a year. Plant the Bolleana six to ten feet apart, the Simon 12 to 20 feet apart. In several years they should form a solid screen.

Among the other shrubs that may be used for relatively quick results, may we recommend the Persian lilac, the false spiraea, *Sorbaria ditchisoni*, the Vanhoutte spiraea, the flowering currant (where not prohibited because of white pine blister rust), the common barberry (where not prohibited because of wheat rust), the golden-bells, *Forsythia spectabilis*, the blood-twist dogwood, *Cornus sanguinea*, the gray dogwood, *Cornus paniculata*, and the butterfly-bush, *Buddleia*.

These are but a few of many shrubs that might be suggested, but they are those which experience has shown to be the most practical, the most satisfactory, under a wide range of conditions. But do not forget that with the best of shrubs planted in either the fall or early spring, you have to do your best to secure the maximum results.

INDOORS AND OUT

(Continued from page 135)

"burly, dozing" hordes of summer—alone—she must know something akin to a wish "that it was summer." I am not worried, however, about the chipmunk. He always seems to be having a boyishly good time, and March generally brings him life above ground again. As far as the birds are concerned, I think that Maurice Thompson in the quotation I have already made has given adequate human expression of how the migrating birds must react to March. I always like to think of the kingfisher hurrying back to the Allegheny River, and of the rosy (so-called purple) finches stopping off a while with me in Washington. I am not in

the least bit worried about the blackbirds in March, either, though I do wish some one would tell me the true translation of their spring song—konk-a-ree, king-quer-ree, kong-quer-ree, bob-a-lee, or o-ka-lee. I have read them all. O-ka-lee seems to me the most authentic, for to me the redwing seems to be playing the same melody as the wood thrush, but on an instrument with a different tone color.

After all, for my own part I can not remember having wished for summer in March. I believe that I agree with Wordsworth, who on the "first mild day in March" in 1798 wrote:

One moment now may give us more

Than years of toiling reason:

Our minds shall drink at every pore

The spirit of the season.

I like the seasons seasoned. I must confess, however, that as I write these words on the ninth day of January I do find myself tempted to wish it were March!

Country Matters—It Certainly Does

Country Matters, written and engraved by Clare Leighton (Macmillan, \$3) as a record of English village life, makes a conscious appeal to American readers. With praise-worthy and optimistic insight, Miss Leighton writes that "town life has encroached on the countryside . . . but there is no break in the beauty and romance of the village", and her help in furthering a high appreciation of these rural elements of our civilization is certainly welcome in our own United States. She is essentially right in presuming that "there are few little differences among the workers on the land, whether they dwell in an English village, or gather the olives of a Mediterranean island, or till the red earth of Georgia." Miss Leighton's word sketches "Tramps", "The Village Fair", "The Ploughing Match", "Felling Trees", and her ten others, exemplify the esthetic value of the village way of life, and her seventy-some engravings on wood show beautifully its appeal to the artist. The second word of the title *Country Matters* may, after all, be a verb, and if so, one reader at least leaves the book with the thought, "It certainly does." The hope is that it may continue to seem so to the blacksmith and the other village folk themselves, for, as Miss Leighton says, "Into this fussed and restless world they bring the quiet of the hills and the simplicity of elemental thought." To the extent that they continue to do this they will make the world better for all of us.

H. Z.

DIANA THORNE'S DOG COLUMN

(Continued from page 189)

account of one Irish terrier and certainly not a commentary on the whole of his family. It is an anecdote of an experience—an experience with a "temperament". It is not intended as a comment on the breed; but, inasmuch as the burnt child is cautious with fire, I have prudently refrained, since those hectic days from having an Irishman in my care!

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Yosemite Birds

The January, 1938, issue of *Yosemite Nature Notes* is a special edition devoted to Birds of Yosemite. It is the joint work of C. A. Harwell and M. E. Beatty, respectively Park Naturalist and assistant Park Naturalist of Yosemite. There are twenty-three species regularly present in the Transition Zone areas of the Park throughout the year, and thirty-five species classed as summer visitors. Thus fifty-eight species, all possibly nesting in Yosemite Park, are covered and described. In addition, listing is given to fifteen species visiting the Park in the winter. The text is illustrated and an excellent index is provided. Copies of this special edition are available from the Yosemite Natural History Association, Yosemite Park, California, at twenty-five cents a copy.

Easter Seals

Mindful of the many crippled children who find great joy in studying and observing the world of Nature, although they cherish little hope of tramping the fields, may we urge the purchase of Easter Seals distributed by the International Society for Crippled Children to further work that is designed to give strength to these handicapped youngsters. The 1938 seal shows a little girl, a crutch under one arm, watering an Easter lily that represents the hope of a better life. The headquarters of the Society are in Elyria, Ohio.

An American Hunter

Under the above title Archibald Rutledge, well known as an outdoor writer and poet, and for many years a teacher of English at Mercersburg, Pa., has issued a series of essays on various experiences in wood and field. Many are centered about his home in the Delta of the Santee in South Carolina; others concern excursions among the mountains of Pennsylvania; many are general descriptions of notable species—the Virginia deer, diamond-back rattler, woodcock, alligator, wild turkey, or ruffed grouse.

"A Stalk on the Dunes" of Bull Island, now a government sanctuary, opens this delightful book. Other chapters are "The Great King", "The Ducks at Tranquillity", "Snipe of the Pinelands", "Quail of the Kalmias", "The Killer of Hell Hole" and "Footsteps in the Forest"—to pick a few almost at random. There is much more than hunting in this book, and one who reads its forty-five chapters without prejudice will close the book marveling at its fund of knowledge concerning the life habits of many dozens of our wild species, and a feeling that he has listened to the well-told tales of a sportsman.

This beautiful sample of book making—skillfully written, well illustrated and finely printed—is published by Frederick A. Stokes Company, New York, and is priced at \$4.00. E. A. P.

For Herpetologists

Of interest to students of reptiles, and zoologists generally, is *Axial Bifurcation in Serpents*, by Bert Cunningham of Duke University. In sum, this book is an historical survey of serpent monsters having part of the axial skeleton duplicated. It is available from the Duke University Press at Durham, N. C., at \$2.50.

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Photographic Notes

BY SAMUEL BROWN

Our Readers Have Asked

During past months, our readers have presented many interesting problems to this department. Although all of these inquiries have been answered individually, we feel that most of our readers would be interested in a brief discussion of some of the problems generally confronting photographic amateurs. We will therefore devote this month's Photographic Notes to a general answer to miscellaneous questions.

There has been a definite interest in night photography, and many pictures have been received by this department showing results in this field. One of our readers asks for a simple method of making silhouettes. This is easy, requiring the lighting of a white background with practically no light on the subject. By exposing for the background only, the subject is rendered without detail, resulting in a black image against the white background. One of our readers sent us a fine picture secured by this method.

Many questions come up concerning the use of filters. Briefly, a filter eliminates light of a certain color in order to produce an unusual effect. Generally filters are used for photographing clouds against a dark sky. For this purpose, the most suitable filter is a yellow one. When the sky is to be light, the light yellow filter is desirable; for a dark or black sky, which gives the effect of moonlight, a dark yellow or red filter is required.

Modern-day films are much corrected in order to give accurate monochrome values to colored objects, with the exception of blue, to which films are slightly over-sensitive. To get absolutely accurate results, a yellow filter is required. Some Panchromatic films are also over-sensitive to red, and to correct this a medium green filter is used. A good set of three filters for the amateur photographer would be a yellow for general correction; a green for perfect correction with Panchromatic films, and the red for exaggerated results. This latter, however, can be used only for Panchromatic films.

An interesting question asked by one of



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our readers is how he can photograph the image of a reflection in a mirror or crystal ball. This requires no particular technique, but accurate exposure is essential. Be sure that when setting the distance, this should be the distance from the camera to the reflecting surface plus the distance from the latter to the subject.

Candid photography has drawn a great number of enthusiasts. The object of this phase of photography is to photograph persons without their knowledge, and is accomplished by apparently looking in one direction, while photographing in another. Ordinary cameras can be adapted for this purpose by using them sideways, and using the brilliant finder as an angle view finder. By holding the camera on its side, the finder is brought to right angles of the view of the camera. Although in this method the image is seen wrong side up, it should present no difficulty after some practice.

Color photography is becoming more and more popular, especially since films for this purpose have been developed that are exceedingly simple to use and are certain as to results. Dufaycolor film is available in sizes to fit all amateur cameras. It is used like ordinary black and white film, allowing approximately twice as much exposure as is required for Panatomic film. The result is a beautiful color transparency that may be projected, and from which natural color prints may be made. Kodachrome is available to fit cameras using 35 MM film, such as the Leica, Contax, Argus, etc. Beautiful transparencies are secured and are mounted in standard 2"x2" slides and projected in this manner.

A question often asked is how to photograph pets. This phase of photography is comparatively simple and pictures of this kind may easily be made in the street or in a well-lighted room. If the camera has a lens with a speed of at least F. 6.3, these pictures

may be made indoors in a sunlit room, or at night with the aid of two photoflood lamps. If the latter are used, they should be placed in reflectors, bridge lamps, or simple reflectors that may be made from white cardboard. The cat or dog is posed on a chair with two photoflood lamps close by. Using supersensitive Panchromatic film, an exposure of 1/25 of a second at F. 6.3 will get the picture. Try to make your pet pose with some other objects or perhaps it can be dressed in a humorous manner.

We will be pleased to have pictures from our readers showing what they have done with various phases of photography. Unusual pictures will be of particular interest, giving details as to how they were made. We are always pleased to have your comments and suggestions for future articles. There have been several requests for a detailed article on trick photography. Other suggestions were for articles on pin-hole photography, infra-red, motion pictures and color photography. If sufficient requests are received, these will be presented in detail.

* * *

Developing

Last month, we discussed the developing solutions used in photography. We will now proceed with an explanation of the chemistry of fixation. The developing solution reduces the silver salts in the film that have been acted upon by light, in proportion to the amount of light which has reached the film. After this process is complete, there remains in the film some undeveloped silver salts that must be removed to make the image permanent.

A chemical that does this is sodium hyposulphite, commonly called hypo. This chemical, therefore, is the most important ingredient in fixing baths. Although a solu-

tion of hypo would ordinarily work well, it could not remain efficient for long because the chemicals brought over from the developing solution would quickly contaminate it and stain the negatives. All developing solutions contain a certain amount of alkali, together with developing agents that oxidize and become discolored. We must therefore provide some means against contamination in the fixing bath.

In order to neutralize the alkali, a weak acid is generally added to the fixing solution. A favorable chemical for this purpose is acetic acid. However, when acetic acid is added to a hypo solution, it turns the bath milky, decomposing the hypo into free sulphur and sodium sulphite. To offset this, an excess of sodium sulphite is added to the bath, and it is thus possible to add sufficient acid to the fixing bath to neutralize all the alkali added to the hypo without decomposing it. This excess of sodium sulphite also prevents the oxidation of the developing agents carried over into the fixing bath, acting as a preservative by absorbing all the oxygen before it reacts on the developer.

The alkali in the developer has the effect of softening the film and some substance must be added to the fixing bath to harden the gelatin. As potassium alum has the property of tanning the gelatin, this chemical is added to the fixing bath as a hardener.

It is desirable, when developing several rolls of film, to neutralize as much of the alkali as possible before it reaches the fixing bath. Partial hardening is also helpful. With these two actions accomplished before the films reach the fixer, these solutions will last considerably longer and prove much more efficient. Excellent formulas for a short stop and fixing bath are as follows:

ACID SHORT STOP: 28% acetic acid, 3 ounces; potassium alum, 3 ounces; water, 48 ounces.

ACID FIXER: hypo, 16 ounces; water, 64 ounces.

When thoroughly dissolved, add the following hardening solution: water (about 125 degrees F.), 5 ounces; sodium sulphite, desiccated, 1 ounce; acetic acid (28%), 3 ounces; potassium alum, 1 ounce.

Be sure to dissolve the chemicals in the order given above, and it is necessary that each chemical be dissolved before another is added. Allow both solutions to cool, adding the hardener while stirring the hypo.

* * *

Trade Hints and New Books

A supply of the latest edition of *Modern Developing Technique* has just come to hand. This little booklet has long been the accepted authority on developing processes and the new edition contains much new material not supplied in earlier editions. Formulas for fine grain developing and fixing solutions are given, discussions on print development and helpful suggestions for improving your work makes this a valuable piece of literature. Be sure to send to this department for your copy. No charge, but please enclose a three-cent stamp for return postage.

* * *

Long awaited news—an inexpensive candid camera with built-in range finder—is this month's highlight item. The new model "C" Argus camera makes its appearance with many features over earlier models. The faster F.3.5 lens will allow picture making under

poor light conditions, range finder will assure sharp focus, hinged back makes for easy loading and its improved appearance makes it more attractive. The International Research Corp., Ann Arbor, Mich., will be happy to send full details. Be sure to mention *NATURE MAGAZINE*.

* * *

The Leica exhibit which was such a huge success in New York is making a tour of many of the larger cities in the United States. Drop a line to E. Leitz, 730 Fifth Avenue, New York City, for the exhibit's itinerary.

* * *

The "Third Rolleiflex Salon" to be held from May 2nd to 8th at Rockefeller Center, New York, is now open for entries. Owners of Rolleiflex, Rolleicord, Heidoscope and Rolleidoscope cameras are invited to contribute. Entries should be made to Burleigh Brooks, 127 West 42nd Street, New York City. Name and address of contestant must be pasted or written on the back of each mount, and sufficient return postage must be enclosed. Data on exposure, film and paper should also be given. Thirty-one cash prizes will be awarded winning pictures. Further details may be had by writing Burleigh Brooks.

* * *

The Command To Look by William Mortensen, Camera Craft Publishing Co., 425 Bush Street, San Francisco, Calif. Price \$2.00.

The latest addition to the "Mortensen library" is *The Command To Look* or, aptly subtitled, "A Formula for Picture Success". Every amateur has wondered why the pictures he makes never get so far as salons and exhibitions while time and again the same names consistently appear under exhibited photographs. In this new book, Mr. Mortensen reveals the secrets of his success as a photographer, what to get into the picture, what to leave out and how to combine the various elements so that they find favor with the salon judges. Illustrated with fifty-five of Mr. Mortensen's most delightful salon prints and comments on how they were made, this book is as practical as it is beautiful.

* * *

The photographic department of *NATURE MAGAZINE* is edited for its readers interested in photography and maintains a service which renders assistance with any photographic problem. You are invited to take advantage of this service. Address all photographic inquiries to Samuel Brown, *NATURE MAGAZINE*, 1214 Sixteenth Street, N.W., Washington, D. C.

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New York—295 Madison Avenue
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Chicago—203 N. Wabash Ave.
Los Angeles—Western Pacific Bldg.
San Francisco—Mills Bldg.

NATURE MAGAZINE is published monthly by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D. C. Additional entry at Greenwich, Conn.

Publication and Editorial Office, 1214 16th Street, N. W., Washington, D. C. Additional Office of Publication, Greenwich, Conn.

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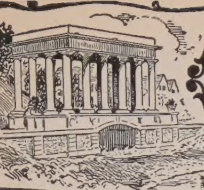
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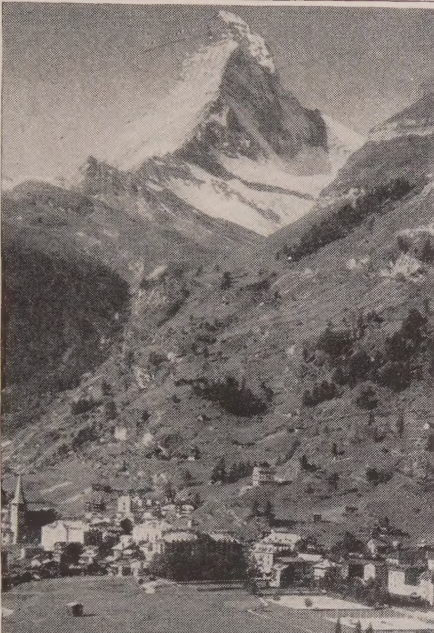
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Woodpecker House

A bird house designed by the late Freiherr von Berlepsch, world-renowned German ornithologist, copied from a woodpecker's hole, happened in this way.

According to traditional custom the forests in parts of Europe were thoroughly cleaned of all dead timber. But something developed that the well-meaning foresters had not foreseen. The insects multiplied at an alarming rate and soon became a serious pest.

It was evident that some important factor had been overlooked. The birds and their useful work had been entirely forgotten. Many of the forest birds are of hole-nesting species, and they had depended on the dead trees. Now these birds had been robbed of their home

sites, and decreased rapidly. The woodpeckers especially were hard hit, as they were unable to fashion their holes in living trees. It is their custom to hammer on a dead tree and judge by the sound whether it is soft enough for their purposes. If it appears suitable, they will peck through the hard shell and fashion their home in its interior. But only once do they use a hole to raise their young, and therefore a new home is made each time they breed, and the old ones are left to the other hole-nesting birds.

This interesting subject was studied by von Berlepsch over a period of years and he decided that it was not necessary to wait until there should be a fresh supply of dead trees. He located trees with woodpecker holes in them, cut these trees down and sawed the cavities in half. Doing this with many trees

and carefully measuring each hole, he selected a number of patterns after which he designed his now famous bird-boxes. These were manufactured in great quantities and their wide-spread use helped the birds to increase for work on the insects.

Circular ridges inside help the birds to cling, especially when feeding the young. The inside is kept rough and the walls are made thick to insure uniform temperatures throughout the twenty-four hours, thus helping the broods at times of excessive heat. A round bottom prompts the birds to bring in only a little nesting material, thus giving parasites less chance, and also helps to keep the eggs together, insuring more successful broods. The dimensions of the cavity, the height of the entrance, and other features are all carefully worked out.



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Indoors and Out

By HOWARD ZAHNISER

IT WILL BE seventy years the first of this April since John Muir left an Oakland ferry, set out afoot, and "wandered, enchanted in long, wavering curves" toward Yosemite Valley. "It was the bloom-time of the year over the lowlands and coast ranges; the landscapes of the Santa Clara Valley were fairly drenched with sunshine, all the air was quivering with the songs of the meadowlarks, and the hills were so covered with flowers that they seemed to be painted." The air was "spicy and exhilarating." John Muir later wrote that he "had lived on common air for nearly thirty years, and never before this discovered that our bodies contained such multitudes of palates, or that this mortal flesh, so little valued by philosophers and teachers, was possessed of so vast a capacity for happiness."

Those thirty years of common air, added to the seventy since that memorable April day, make up the hundred for the centennial anniversary of John Muir's birth on April 21, 1838. Those thirty years are described in Muir's *Story of My Boyhood and Youth* and in his *Thousand-Mile Walk to the Gulf*. They could seem common only in comparison with a great exhilaration. They began in Dunbar, Scotland, continued in a pioneer home in Wisconsin, and included in their last decade travels afoot in Wisconsin, Iowa, Illinois, Indiana, Canada, and southward from the Ohio River to both the Atlantic and Gulf coasts of Florida—as well as the ocean voyages that landed Muir in San Francisco. Common! The boy in Scotland memorized all of the New Testament and most of the Old Testament. The pioneer boy in Wisconsin did a man's work, yet made of himself a true student of books. For months once he worked on a ninety-foot well, alone chiseling through eighty feet of sandstone. Forbidden to read in the evenings after long hours of hard work, he unexpectedly took as literal his father's suggestion that he rise earlier if he would read. To get himself out of bed he devised a clock with synchronized mechanism that would land him on the floor at his early-rising hour. When he came of age he carried his invention to the State fair and found it an open sesame to the University of Wisconsin. There a chance discussion with a fellow student about a locust blossom brought him the expulsive power of a new enthusiasm. "This fine lesson," he later wrote, "charmed me and sent me flying to the woods and meadows in wild enthusiasm." John Muir was already a seasoned naturalist when he arrived in California at the age of thirty.

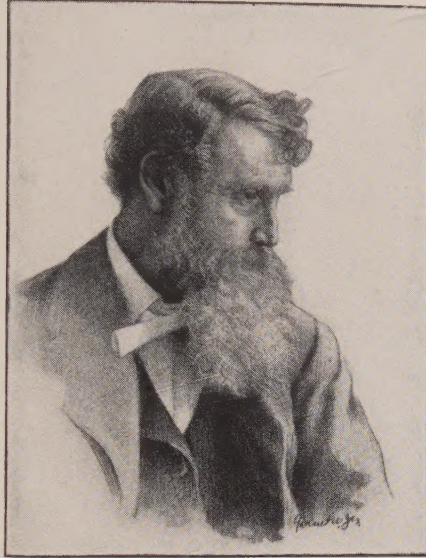
Undoubtedly, though, all earlier experience did seem common when Muir saw the Sierra Nevadas from Pacheco

Pass that April day. It seemed to him that the mountains should be called "not the Nevada, or Snowy Range, but the Range of Light." And after spending ten years "in the heart of it, rejoicing and wondering, bathing in its glorious floods of light, seeing the sunbursts of morning among the icy peaks, the noonday radiance of the trees and rocks and snow, the flush of the alpenglow, and a thousand dashing waterfalls with their marvellous abundance of irised spray," the Sierra still seemed to John Muir "most divinely beautiful."

There are Paul Bunyan legends that one enjoys with a sense of allegorical truth, but even these legends have less of marvel than the actual facts of the exploits of John Muir—standing on the brink of the Yosemite waterfall on a ledge unattainable to anyone else, traversing glaciers all day in shirt sleeves with only bread and tea for nourishment, exploring the depths of crevasses, and taking mountains and forests in his strides—not Paul Bunyan strides but the actual foot-steps of an indefatigable man. Once he rescued a companion from a precipice by carry-

ing him with his teeth gripping the shirt collar. The exploits on the glacier trip made with the great dog Stickeen are well known, for they are part of the story *Stickeen*, and there are other thrilling adventures told in the factual descriptions of John Muir's travels.

Emerson visited John Muir in Yosemite, and called him "the right man in the right place." Yet the full import of the truth of Emerson's judgment could hardly have been apparent until Muir began to write. Friends who knew his eloquence in conversation and in correspondence urged him into print, for strangely enough he had not thought of himself as a writer. He began by contributing to newspapers and magazines. About the age of fifty he edited and contributed to an immense work entitled *Picturesque California and the Region West of the Rocky Mountains, from Alaska to Mexico*. But it was not until 1894 that his first book was published. This was *The Mountains of California*. In 1901 he published *Our National Parks*, in 1909 *Stickeen*, in 1911 *My First Summer in the Sierra* and a tribute entitled *Edward Henry Harriman*, in 1912 *The Yosemite*, and in 1913 *The Story of My Boyhood and Youth*. These were the books published during his lifetime. When he died of pneumonia in a hospital on Christmas Eve in 1914 he had almost completed his *Travels in Alaska*, published in 1915, and he left journals, manuscripts, and uncollected articles for other posthumous volumes: *A Thousand-Mile Walk to the Gulf* (1916), *The Cruise* (Continued on page 252)



JOHN MUIR
1838-1914



SPIDER MONKEYS OF SOUTH AMERICA

(See Page 205)

Among the largest of the American monkeys, they have the most wonderfully developed limbs and tails for climbing of any living mammal. With a piece of fruit in one hand, a spider monkey can pick another piece with one foot, put food in his mouth with the other hand, meanwhile swinging from branch to branch with the other foot and his tail, which appears to have as much ability to feel as does a hand.